CIVIL DEFENSE FOR NATIONAL SURVIVAL

(PART 3—Dr. Lester Machta, C. D. Curtiss, Otto L. Nelson, Jr., Dr. Lauriston S. Taylor, Dr. Harold K. Skramstad, Dr. Ralph Lapp, Dean Snyder, Dr. Leonard Scheele, William L. Mitchell, Shelby T. Grey, Dr. John R. Luddington, Dr. Charles L. Dunham, Dr. Eugene P. Cronkite, Dr. G. Burroughs Mider, Edward Cohen, H. L. Bowman, J. Edmund Fitzgerald, Martin D. Kirkpatrick, and John P. Chapman)

HEARINGS

BEFORE A

SUBCOMMITTEE OF THE COMMITTEE ON GOVERNMENT OPERATIONS HOUSE OF REPRESENTATIVES

EIGHTY-FOURTH CONGRESS

SECOND SESSION

MARCH 13, 14, 15, 20, 22, 23, 27, 28, AND 29, 1956

Printed for the use of the
Committee on Government Operations

UNITED STATES
GOVERNMENT PRINTING OFFICE
72796 WASHINGTON : 1956

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CIVIL DEFENSE FOR NATIONAL SURVIVAL

TUESDAY, MARCH 13, 1956

HOUSE OF REPRESENTATIVES,
SUBCOMMITTEE ON MILITARY OPERATIONS OF THE
COMMITTEE ON GOVERNMENT OPERATIONS,
Washington, D. C.

The subcommittee met at 10:10 a. m., in Room 1501 New House Office Building, Hon. Chet Holifield (chairman of the subcommittee) residing.

Present: Representatives Holifield (chairman), Mrs. Griffiths, Riehlman, and Lipscomb.

Also present: Michael P. Balwan, staff director; Herbert Roback, director of investigations; Earl J. Morgan, investigator; and Carey Brewer, Legislative Reference Service, Library of Congress.

Mr. HOLIFIELD. The subcommittee will be in order.

We have before us this morning the United States Weather Bureau representatives and the representatives of the Bureau of Public Roads.

We will call for the first witness, Dr. Machta, Chief of the Special Projects Section and Mr. J. J. Davis, Civil Defense Coordinator of the United States Weather Bureau.

Dr. Machta, we are glad to have you with us this morning.

I see you have a prepared statement, Dr. Machta, would you like to give that first and then have a series of questions?

You may proceed.

STATEMENTS OF DR. LESTER MACHTA, CHIEF, SPECIAL PROJECTS SECTION, AND J. J. DAVIS, CIVIL DEFENSE COORDINATOR, UNITED STATES WEATHER BUREAU

Dr. MACHTA. Weather plays a vital role in distributing radioactive fallout from atomic explosions. When a nuclear bomb is detonated at or near the earth's surface, the minute radioactive bomb fragments attach themselves to soil particles.

The larger of these soil particles and their radioactive coating fall to earth within a short time—from a few minutes to many hours.

As the particles descend, the winds transport them horizontally in exactly the same way that any object is carried by the wind. Where an individual particle lands depends on where it starts, how fast it falls and on the different wind speeds and direction it encounters on its way down to the ground. Experience with our weapons-testing program is sufficient to convince us that two identical bomb detonations under different wind structures will result in entirely different fallout patterns.

There are three questions which a civil-defense director may ask of the weatherman: (1) Where will the fallout occur; (2) how intense will it be; and (3) when will it begin?

The meteorologist can readily advise of likely areas of fallout and arrival times for the beginning of the fallout. All the weathermen must know to give this information is the ground zero, the winds, and the nuclear cloud dimensions.

Maximum values of the cloud sizes can be used in the preattack estimates. With little difficulty, then, the meteorologist can provide areas of potential fallout hazard and the amount of time between bomb explosion and first arrival of the dangerous particles.

To answer the question: "What is the radioactive dosage?" requires all of the information needed to answer the other questions plus certain vital bomb data. One must know the yield, the height of burst, and the nature of soil over which the explosion occurs. Further, it is necessary to infer the kind of particles which will be formed from city rubble from that which we have found from desert sand and island coral.

The prediction of radiation intensities or dosages is much more than a meteorological problem. It is even doubtful whether certain kinds of bomb information such as appropriate yields would ever be obtained in time to be of any use.

Mr. BALWAN. Why do you say that?

Dr. MACHTA. Simply because of the fact that it is necessary to have a complete network of detecting stations to obtain the location of the bomb explosion in order to know the ground zero, and to determine its yield.

Mr. BALWAN. You say, "whether certain kinds of bomb information such as appropriate yields." Are there any other kinds?

Dr. MACHTA. You mean other kinds of yields?

Mr. BALWAN. Other kinds of information?

Dr. MACHTA. Yes. What we need is the yield of the bomb—how many megatons of fissionable products are created—and the height of burst. If the fireball does not intersect the ground, very little fallout results. We must know whether the terrain and installations over which the burst occurs will produce very fine particles or large particles.

The most pressing need of a civil defense director is a preattack estimate of where fallout will occur. The Weather Bureau is fulfilling this need by twice-daily fallout forecasts. Beginning on June 1, 1955, the Weather Bureau undertook to transmit such predictions on weather teletypewriter circuits.

This initial crash program employed only 34 of the upper wind observing stations nearest the major targets in the United States.

On February 1, 1956, this network was expanded to 52 stations. We can show you the distribution over the United States. (See chart No. 1.) The squares indicate the upper air observation stations which are participating in this program. They are distributed and selected to be closest to the major targets in the United States but cover, I believe, regions close to every populated area.

(Chart No. 1 referred to follows:)

CHART NO. 1—UNITED STATES UPPER AIR AND FALLOUT FORECASTING NETWORK

Mr. BALWAN. Might be desirable to have this chart so that it may be included in the record, this information, for anybody who needs it?

Mr. HOLIFIELD. Are you prepared to leave the charts?

Dr. MACHTA. We will provide you with the information.

Mr. HOLIFIELD. Of any of the charts we need?

Dr. MACHTA. Yes.

Mr. HOLIFIELD. We would like to have this one. You have several different designations. Would you mind explaining them before we leave that chart?

Dr. MACHTA. Yes; the upper winds observation is obtained by several types of equipment, some of which are better than others. Each of these types indicate whether we use visual methods for tracking the balloon as it rises, whether we use radar or radiodirection finding equipment. The designation denotes which of this type of equipment is being used.

Mr. HOLIFIELD. Are these locations selected because of being contiguous to primary targets?

Dr. MACHTA. The stations in the fallout network were so selected. The choice of stations at which upper wind observations are taken are selected on the basis of their meteorological desirability.

Mr. HOLIFIELD. They were already selected then previous to this type of work.

Dr. MACHTA. Yes, sir.

Mr. BALWAN. Is Canada cooperating with you in this program in any way?

Dr. MACHTA. Yes, sir; they are.

Mr. HOLIFIELD. They have a similar service, do they?

Dr. MACHTA. They are about to undertake such a service at our suggestion on the basis of the fact that it seems to be quite a desirable program.

Mr. HOLIFIELD. But they do not have any in being at this time?

Mr. DAVIS. Not at this time, sir. They envision eight stations. They have agreed to go into the United States network and they are presently working up the instructions to send to those eight stations. We may see it in the next 30 days perhaps.

Mr. BALWAN. Does fallout affect Canadian cities?

Are bomb bursts on American cities of danger to them?

Dr. MACHTA. Yes. A detonation on Detroit might affect a large part of populated Canada.

Mr. HOLIFIELD. There are prevailing winds which sweep to the north or northeast.

Dr. MACHTA. Yes, sir.

These fallout messages employing a simple code are transmitted twice each day to over 500 teletype outlets throughout the country. Each of the Weather Bureau field officials has contacted the local or State civil-defense organizations to offer the fallout reports if they want them. There has been no increase in the number of operational personnel to furnish the fallout data required by the Federal Civil Defense Administration.

In an effort to lend meteorological support to FCDA, and to bring better public understanding of fallout forecasts, the Weather Bureau has assigned nine fulltime experienced meteorologists to the FCDA national and regional offices.

These specialists serve as staff meterologists to FCDA officials, and advise them on all fallout problems, and natural disasters, such as

floods, tornadoes, hurricanes, drought, and the like. They travel in FCDA regions, perform liaison with State and local civil defense agencies, and assist in training local employees to decode, plot, and use fallout forecasts.

The cost of the Weather Bureau's civil defense activities has been substantially met by money transferred from the Federal Civil Defense Administration. Salaries and travel expenses of nine professional meteorologists in FCDA offices and two meteorologists in the Weather Bureau Central Office are paid from this source.

We call the fallout forecasts UF winds by virtue of their communications heading on the teletype circuit. The UF winds tell where the fallout may be and when it will get there.

As yet, the Weathetr Bureau is routinely transmitting no dosage estimates. The ability to estimate dosages given the bomb yield and other essential information is limited, in the Weather Bureau, to a few scientists who have been engaged in specialized research for the Atomic Energy Commission and the Department of Defense.

The Weather Bureau believes that the dosage prediction problem can best be solved by the use of electronic computers.

Mr. BALWAN. Does this mean that you people are not concerned or have the capability because of scientists to predict dosages as well as general direction of fallout?

Dr. MACHTA. That is correct, sir. The Weather Bureau field offices do not have this capability. It is limited to a very few people who have access to data provided by the Atomic Energy Commission. I offer a suggestion in the next paragraphs which we think is a practical way to predict radioactive dosages.

It is possible, at present, to predict radioactive dosages from a given wind structure by using highspeed electronic digital computers in about 20 minutes. One may obtain a hand computation in about 30 minutes which provides much less detail.

However, with the financial assistance of the Atomic Energy Commission and under the Weather Bureau direction, the National Bureau of Standards has constructed an ingenious electronic analogue fallout computer.

This device instantaneously displays the geographical distribution and dosage pattern of radioactive fallout visually on the face of a television-like tube.

Mr. BALWAN. Dr. Machta, I believe you have an exhibit that you might describe this more fully.

Would it be of any use for the subcommittee using an electronic analogue computer and a digital computer?

Dr. MACHTA. Yes, there is a significant difference. An electronic digital computer, such as Remington Rand or IBM produce, costs in the order of 2 or 3 million dollars. It covers about half the area of this room. An electronic analog computer would occupy a tenth of the area of this desk, would cost less than $10,000, but would predict only fallout. An electronic digital computer is more versatile.

This analog fallout computer consists of a series of knobs (see chart No. 2) for each altitude above the ground up to perhaps 90,000 feet or 100,000 feet in which a setting for the wind direction and wind speed would be made for the appropriate altitude. Another series of knobs not shown here would be set for the yield of the weapon, for the height of burst and for any other information which is necessary.

(Chart No. 2 referred to follows:)

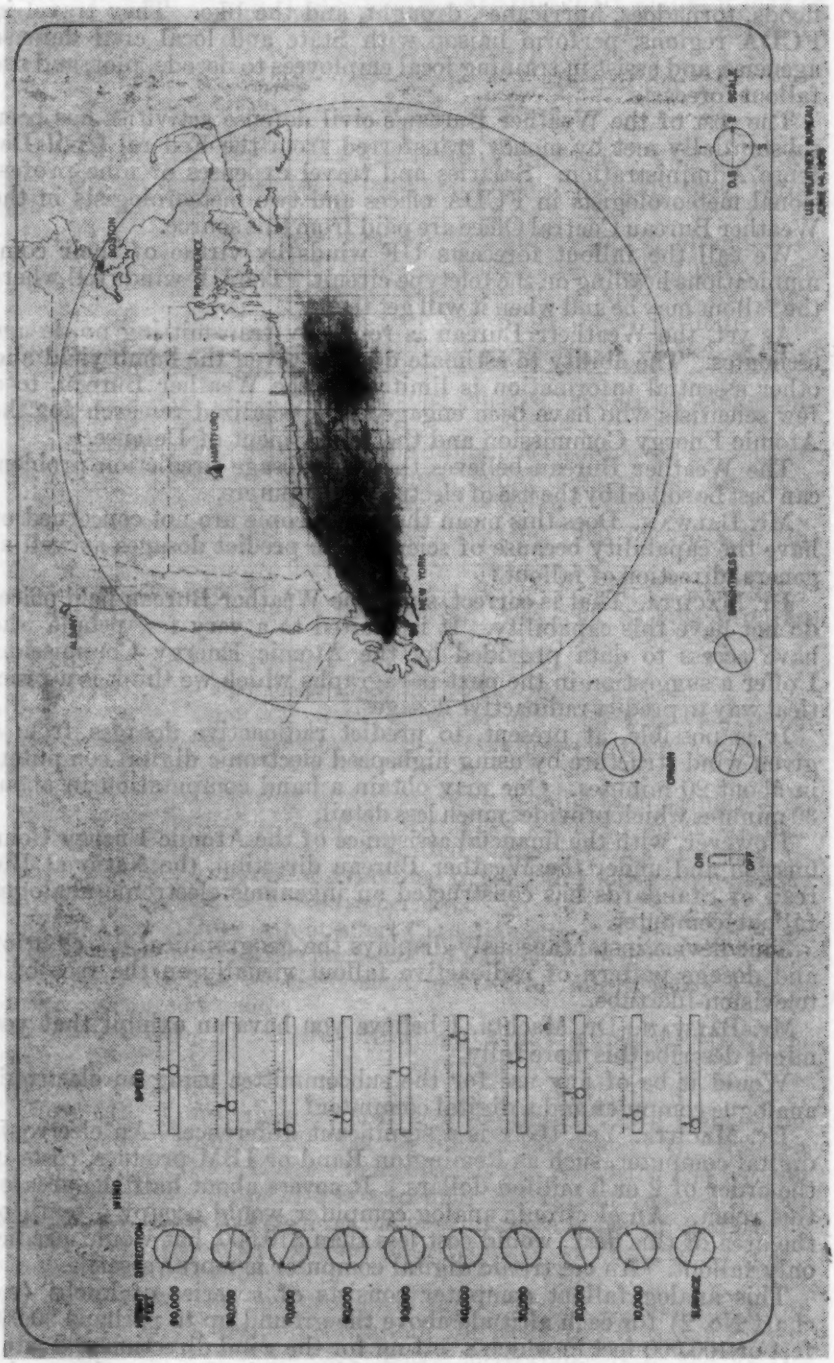


CHART NO. 2—ANALOGUE FALLOUT COMPUTER PORTRAYING FALLOUT FROM HYPOTHETICAL BOMB DROP OVER MANHATTAN

Dr. MACHTA. On the face of a television tube, one would see the brightness proportional to the radioactive intensity. If one were to overlay a transparent map on this pattern one may note the area affected by fallout. From this pattern and the map overlay, we get an idea of the fallout pattern from an explosion taking place over New York City and thus we may give the civil defense director an idea of the direction toward which the fallout will occur in the event of an enemy attack.

Mr. ROBACK. Mr. Chairman, may I ask here, Dr. Machta later in the statement makes the point that obviously one will not know what the characteristics of the enemy weapon are since the enemy is not telling about it before they drop it.

How can you measure dosage here without some kind of specific dosage measurement, without somebody going out and actually measuring somewhere so you can project?

Dr. MACHTA. This is a prediction of what would happen if the enemy would drop a bomb of a given yield. We would have to obtain statements of estimates from FCDA of their guess of the maximum likely yield of the weapon the enemy would drop. This would be set in the machine in a pre-attack pattern to determine the pre-attack fallout pattern.

After the attack, if the information were available as to the yield of the weapon, its height of burst and knowing it occurs over a city, let us say, one could adjust the knobs and then determine a more realistic and likely fallout pattern.

Mr. ROBACK. My question is this: Is there a substitute for measuring actual dosages in areas which are subject to the question, shall you keep out of them or go into them?

Dr. MACHTA. The answer is very definitely no. One must monitor to find cut what the dosage is.

Mr. ROBACK. This would be most useful in exercises.

Dr. MACHTA. It is true that it is very useful in exercises but the computer prediction would be useful as a guide if nothing else were available.

Mr. HOLIFIELD. Having had some experience with the South Pacific in these things, these tests, of course, the computation of the different instruments, which have to do with the blast power and the thermo-power and the radioactive power in every instance of course those computations are made with the basic knowledge of exactly where the bomb is exploded, how high it is exploded from the ground and with the knowledge of the type of dust or coral or whatever it happens to be underneath it.

As we are now set up in the United States, all these different target areas are vulnerable to attack and without the scientific instruments to register impact, force velocity, dosage, and the other pertinent factors, is it not true that you will be lacking basic information to feed into these machines even if they are available?

Dr. MACHTA. Your statement is entirely true and it is for this reason that the Weather Bureau at the moment is not providing dosages. The area into which fallout will occur is largely independent of the parameters you have just mentioned and we can estimate the area and the time of arrival almost exclusively from pure weather data and it is only this information which we are now transmitting.

Mr. HOLIFIELD. This information would be useful particularly as a guide to evacuation, would it not?

Dr. MACHTA. It could be useful of course to advise people to take shelter.

Mr. HOLIFIELD. The point I mean is, if you have a general wind direction regardless of whether you know the dosage, the exact dosage or not, you would know that this was one area that you would not want to evacuate into.

Dr. MACHTA. Absolutely, sir; yes, sir.

Mr. BALWAN. I think Dr. Machta later says also that this has usefulness in directing detection teams, in telling them what area to go to, at least.

Mr. HOLIFIELD. To monitor the exact dosage.

Dr. MACHTA. Yes, sir.

The input data—on this electronic analog computer—such as winds, yield, and height of burst are introduced as dial settings which require no skill on the part of the operator.

It is our hope that a version of this machine can be employed by those active civil-defense communities which are prepared to use the resulting information. But it must be emphasized again that computations of dosage patterns can only be made if the yield of the bomb, its height of burst, and other data are known—a situation not likely to prevail in the event of an enemy attack at this time. However, numerous research groups are actively grappling with this problem and there are plans for its solution.

I would now like to turn to a climatological study which we are making in the Weather Bureau.

The Federal Civil Defense Administration and other agencies are anxious to know which directions from any target city are most likely to be safe from fallout. New industrial construction and emergency storage facilities can be located where they will be least endangered. A study to obtain this kind of data has been recently authorized for the Weather Bureau and good progress is being made in its execution.

The final results are to be presented by seasons, the summer study will be ready on May 15, 1956; the fall study on June 15, 1956; the winter study between July 15 and August 1, 1956; the spring study on September 1, 1956.

The results will permit one to judge also the relative desirability—falloutwise—of, say, a plant location northeast rather than southeast of a potential target. One will be able to estimate the average number of hours of warning, after a bomb drop, each locality will have before the fallout begins. Further, if no current weather data is available at the time of an attack, these statistics will represent the only estimates of likely fallout sectors a civil defense director may have.

Mr. MORGAN. Do you have any illustrations or charts with you that you might explain this a little more fully to the subcommittee?

Dr. MACHTA. Yes. (See chart No. 3.)

This is a hypothetical example of the kind of results which we hope to obtain from our climatalogical study. The city being used as the target is Detroit, Mich. These isolines shown in heavy black represent the probability of fallout occurring within 3 hours after a bomb has been dropped on Detroit, so that for example, at Buffalo the probability that the fallout will occur as soon as or sooner than 3 hours from an explosion which takes place at Detroit is only 10 percent.

(Chart No. 3 referred to follows:)

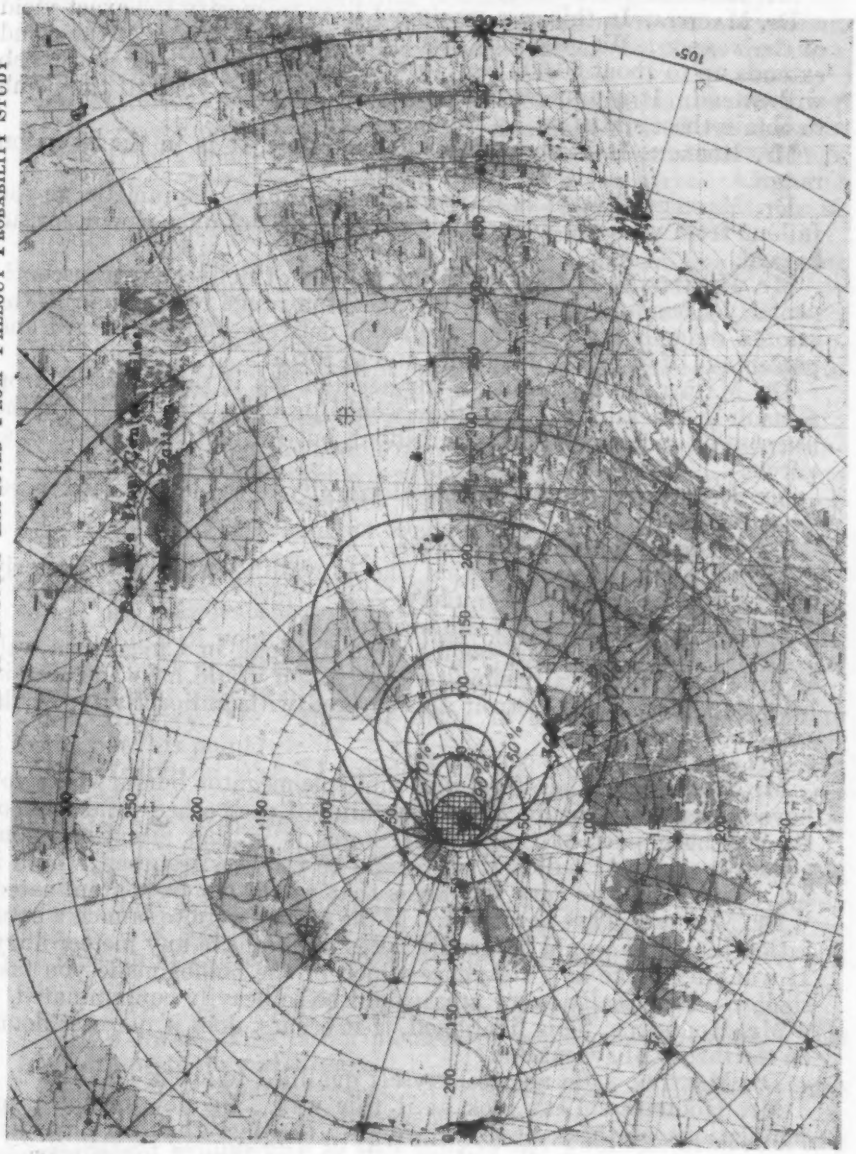


CHART NO. 3—HYPOTHETICAL EXAMPLE OF RESULTS EXPECTED FROM FALLOUT PROBABILITY STUDY

Dr. MACHTA. We will have like statistics to show the likelihood of fallout occurring in 6 hours after the time of an explosion and for 12 hours.

Mr. ROBACK. What bomb are you using in that example?

Dr. MACHTA. In this case we do not have to specify the exact yield of the weapon. We need only assume that the mushroom of the cloud extends up to about 80,000 feet, to which almost every megaton bomb will extend. It is unnecessary to specify the exact yield of the bomb to obtain these statistics.

Mr. ROBACK. It is above the kiloton range, it is in the megaton range.

Dr. MACHTA. Yes, it is in the megaton range. By and large the fallout from weapons in the kiloton range do not offer a widespread hazard.

Mr. HOLIFIELD. If they go to the trouble of delivering transcontinentally a bomb it would be in the megaton range rather than in the kiloton range because of the expense of delivery and the hazard and percentage of defaults and aborts and so forth.

Dr. MACHTA. One might go further and say if they were to drop a bomb in the kiloton range they would probably not use it for the purpose of endangering us with fallout, but for its blast and thermal effects.

Mr. HOLIFIELD. I notice another large city to the left of zero there, what city is that?

Dr. MACHTA. This is Chicago, sir.

Mr. HOLIFILD. Assuming that the prevailing wind was easterly and I suppose that is what you have——

Dr. MACHTA. This way, from west to east.

Mr. HOLIFIELD. And if bombs were dropped in Chicago as well as in Detroit, practically simultaneously, you would have the area in between Chicago and Detroit also covered with radioactivity, would you not?

Dr. MACHTA. This is correct, sir.

Mr. HOLIFIELD. Therefore, with multiple megaton bursts where you have target areas within 200 or 300 miles of each other—and most of the northern part of the United States is in that situation—your general pattern of radioactivity would be fairly wirespread, would it not, there would be very few areas that would not be contaminated.

Dr. MACHTA. That is correct. If the enemy were to launch a saturation attack, it would be hardly necessary to have any meteorology. It wouldn't make any difference which of the bombs made you take shelter. Practically every area would be so heavily contaminated.

Mr. HOLIFIELD. This likelihood, if it occurs, does it not cast doubt on the theory of evacuation?

Dr. MACHTA. I do not feel myself qualified to speak on this.

Mr. HOLIFIELD. Let's look at it this way. In view of the large populations of these cities, in view of the fact that we have had testimony to indicate that there will be less than 3 hours warning time for bomber attack, an exercise in mathematics relating to the movements of people would indicate that they could not be moved 250 miles within a period of 3 hours.

Dr. MACHTA. Yes.

Mr. HOLIFIELD. And therefore if they were moved in the direction of prevailing wind, they would still be in the area of fallout.

Dr. MACHTA. Yes.

Mr. HOLIFIELD. In that case, it seems to me that shelter becomes more important in the future than evacuation, we should be exploring the possibilities of shelter rather than evacuation, if we are talking about a surprise attack. If we have weeks of warning, that is a different situation of course.

Dr. MACHTA. The material which the Weather Bureau is providing I think goes along with this kind of reasoning, in that we are able to tell, after a bomb goes off, how much time one has to store things in shelters so as to be able to live there for a few days. After the bomb goes off, almost any downwind city has anywhere from 15 minutes to 6 or 8 hours before the fallout occurs.

If you can put provisions in your shelter, one can live there for days, I would think.

Mr. RIEHLMAN. If the winds are predominantly toward the east, following your discussion, and bombs were dropped on Chicago, Detroit and Pittsburgh, then it would be just absolutely hopeless to evacuate any city in New York State.

There would be no possibility for that whatsoever. It gets back to your suggestion that the people do whatever they can to protect themselves and take cover right where they are, because there would be no place for them to evacuate to. They would not have time enough to get to an area that would not be contaminated.

Mr. HOLIFIELD. Even your distances north and south from your target center becomes a matter of 100 to 150 miles and that itself would preclude evacuation within a period of 2 or 3 hours.

The width of your directional fan there, the wide part in this instance would occur near the city of Detroit even though it were dropped over the city of Chicago.

Dr. MACHTA. Yes. May we bring in a different illustration to bring out this point?

Mr. HOLIFIELD. Yes. I wondered if you had some multiple——

Dr. MACHTA. This illustrates (see chart No. 4) the kind of sector in which the far downwind fallout will most likely occur.

(Chart No. 4 referred to appears on page 612.)

Dr. MACHTA. It is the area shown on the figure labeled "Mushroom head fallout sector." This tells us for one individual bomb, roughly how wide a sector will be affected. If one were to have another detonation at Cleveland, you would put out another one there, and so on.

The entire area would be essentially contaminated by fallout.

Mr. BALWAN. This is not an area of equal contamination. This has nothing to do with dosage.

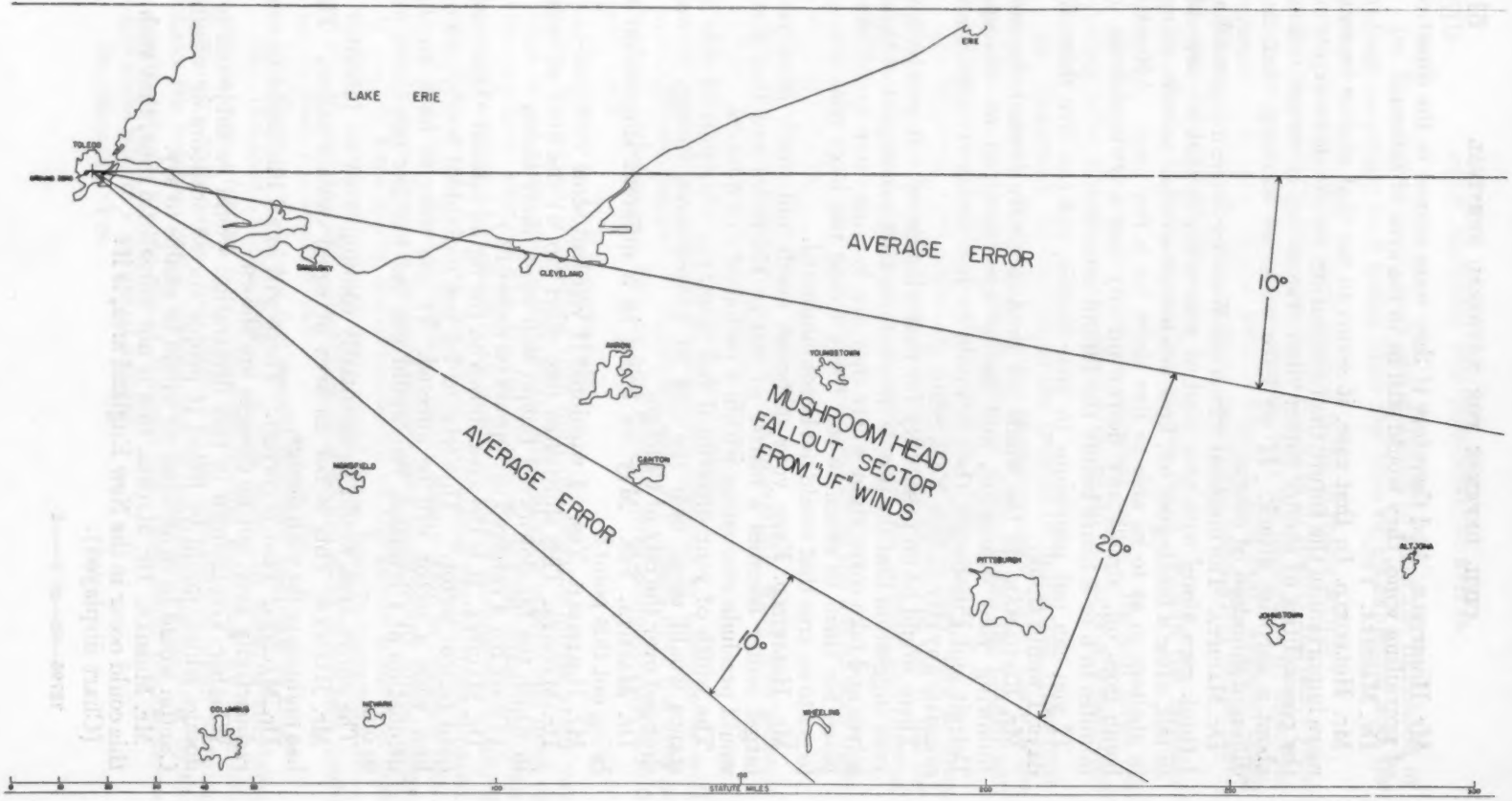
Dr. MACHTA. That is correct. There will in all likelihood be some radioactivity here, but no dosages are shown.

Whether Youngstown in this illustration would be subjected to a dosage which would be lethal if people stayed outdoors or whether Canton would be so affected we would be unable to say.

Mr. MORGAN. Dr. Machta, this is not unrealistic then, that such as this could occur in the New England area, is it?

(Chart displayed).

CHART NO. 4—ILLUSTRATION OF FAR DOWNWIND FALLOUT SECTOR



Dr. MACHTA. Not at all, sir. It could be much worse than that, if the attack were heavier.

Mr. HOLIFIELD. Your dosages would be increased in all areas where there was overlapping of fallout?

Dr. MACHTA. Yes, sir.

Mr. HOLIFIELD. We cannot reasonably assume that your fallout downwind would be confined to one directional movement of air at a particular level, can we?

Dr. MATCHA. No, sir.

Mr. HOLIFIELD. In other words, the trouble we got into out in Eniwetok was compounded of several things, of course, but certainly one of the factors was that the yield was higher than the scientists expected and the upward column of debris went higher than they expected and it was carried downwind in directional slants at levels which had not been predicted. The high-level winds, in other words, if I make myself plain, at different levels your direction might go like this.

If it is only going to go let us say 40,000 feet high, this wind would carry it, but if it went fifty or sixty thousand feet high and got into another current, it would spread out your fan. In other words, you would have 2 or 3 fans at different levels, would you not?

Dr. MACHTA. Yes, sir. Along the same line, sir, we recognize that the forecasts which we are providing are by no means perfect and we are obtaining statistics on the error in the area covered by the mushroom head fallout—which we believe to be the dangerous fallout. While we might predict a sector in the east-southeast direction we recognize that if the bomb were to be detonated 12 hours later and we are making a prediction based on the present winds an error of 10° on either side might, on the average, occur.

Mr. HOLIFIELD. There could be a degree in the shift of the main wind current that would carry it at least 10° to the right or left.

Dr. MACHTA. Yes. That is the sector correction required for a 50 percent likelihood of the fallout occurring within the predicted area. If one wanted a 90 percent likelihood, the error sector would have to be enlarged.

Mr. HOLIFIELD. Without casting reflection on the science of prediction, because I realize we are getting into a new field which we are exploring, it would be safe to say that as of now, the Weather Bureau is not equipped to furnish accurate predictions of fallout for the principal target areas of the United States, for each hour of the day or rather—yes, let us say each part of the day, not hour.

Dr. MACHTA. I don't believe this is quite a fair statement.

Mr. HOLIFIELD. I am putting it in the form of a question.

Dr. MACHTA. I would say we can furnish information which, with limitations, would be of considerable value. It is seen that the average error is, after all, only about 10° and it would be more desirable to know that the fallout would lie to the east-southeast rather than in the sector or to the south in a sector to the north.

Despite the fact that we cannot predict with perfection by limiting the area of fallout to a relatively narrow sector, we are providing advice which a civil-defense director can usefully employ.

Mr. ROBACK. 50 percent of the time that would be the sector; 50 percent of the time the sector could be anywhere in the circle.

Dr. MACHTA. Yes. We would then have to provide the civil-defense director with additional statistics which might increase the sector by 20° of 30° if he wanted, say, 90 percent confidence of the true fallout occurring within the predicted sector.

Mr. HOLIFIELD. Your basic interpretation rests upon knowledge of where the bomb was exploded in terms of latitude and in terms of altitude and also the power of the bombs does it not?

Dr. MACHTA. No. These calculations of the area in which some fallout might occur are independent of the nature of the bomb. If the burst is sufficiently high so the fireball does not intersect the ground, our predicted area of fallout would have no radioactivity within it. This is an analysis made largely from winds.

Mr. HOLIFIELD. Then your element of uncertainty there is dosage?

Dr. MACHTA. That is correct, sir. We don't know whether one has to worry about conditions say at Johnstown which is 300 miles away or not.

Mr. HOLIFIELD. Now tell me this, what reliance can you place upon prevailing winds as of say the quarters of the year? Do they change during the term of the year? In other words would the general prevailing wind, let us say, from Chicago be northeast all during the year or would it change and go in some other directions at certain times of the year?

Dr. MACHTA. May I show you the next picture to illustrate this?

Mr. HOLIFIELD. Yes.

Mr. BALWAN. You also have charts which show the change not only by seasons but within 5 successive days?

(Chart No. 5 referred to appears on the following page.)

Dr. MACHTA. This chart (see chart No. 5) shows the patterns of the directions of wind in the winter season and in the summer season. You can see that in the Northwestern part of the country in the winter we have winds blowing from the northwest, whereas in summertime they blow up from the southwest. By and large except in the Southern portion of the United States in the summertime the winds blow from west to east on the average although the speeds which are the numbers on the charts are much greater in the winter than they are in the summertime.

Mr. HOLIFIELD. That is true at all altitudes?

Dr. MACHTA. This is typically true at almost all altitudes. Yes, sir.

Mr. HOLIFIELD. Although there is some variance in different altitudes in winds, currents and directions.

Dr. MACHTA. That's right. In the lower part of the illustration are hypothetical fallout patterns for individual days. The dots show the hypothetical ground zeros. The diagrams show that on some days the fallout in the West is carried with southwest winds and, on other days, which might be in exactly the same season, with northwest winds.

There is a large variability, although if you had to pick some prevailing wind direction it would be from west to east.

Mr. HOLIFIELD. The local changes in direction, what you would call I guess the secondary directions are quite variable.

Dr. MACHTA. Yes, as illustrated by the lower part of this figure your statement is essentially correct. That is why it is necessary to provide forecasts of the likely fallout sectors. In our opinion this is

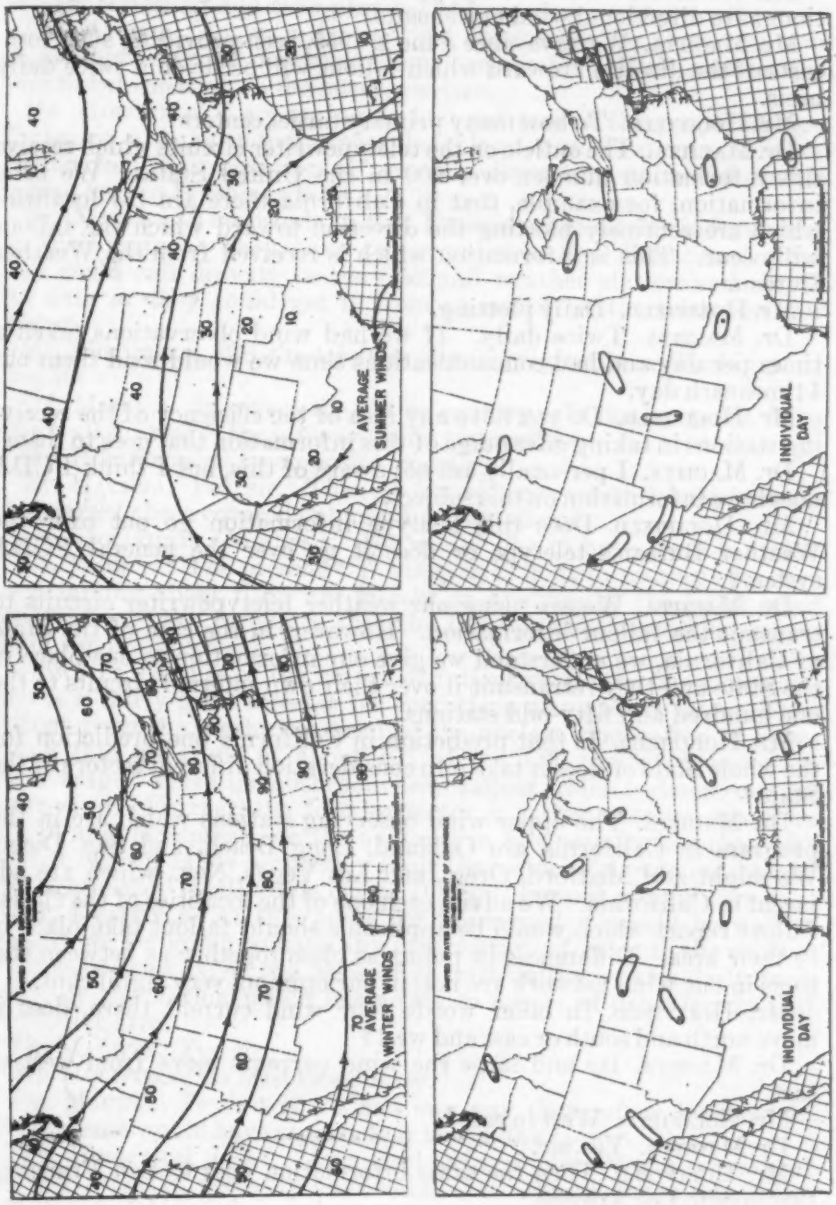


CHART NO. 5—VARIABILITY OF FALLOUT AREAS AND UPPER WINDS

the best way we can provide indications as to whether fallout will occur to the southeast or northeast of ground zero.

Mr. HOLIFIELD. Are you equipped as of now to give daily predictions as to directional wind movements?

Mr. MACHTA. We have since June 1, 1955, been providing such forecasts of the direction toward which fallout will occur on a twice daily basis.

Mr. HOLIFIELD. To how many primary target centers?

Dr. MACHTA. The outlets on the teletypewriter circuits which receive this information number over 500 in the United States. We have information, for example, that in California there are 154 localities which are routinely plotting the direction toward which the fallout will occur. This is information which is received from the Weather Bureau.

Mr. HOLIFIELD. Daily plotting.

Dr. MACHTA. Twice daily. If we had wind observations taken 4 times per day and had communications time we would send them out 4 times each day.

Mr. HOLIFIELD. Do you have any idea of the efficiency of the receiving stations in taking advantage of this information that goes to them?

Dr. MACHTA. I personally am not aware of this, but I think FCDA does have information on this subject.

Mr. HOLIFIELD. Does this teletype information go out over the Weather Bureau's teletype or does it go over the general FCDA system?

Dr. MACHTA. We are using our weather teletypewriter circuits to transmit the fallout information. However, in the case of the State of California, we understand we give our information to one place in the State and they retransmit it over their own internal circuits to the one hundred and fifty-odd stations.

Mr. HOLIFIELD. Is that prediction in California one prediction for the whole State or does it take into consideration different sectors of the State?

Dr. MACHTA. The upper wind observing stations which are in the program in California are Oakland, Long Beach, and San Diego. We might add Medford, Oreg., and Los Vegas, Nev., which are adjacent to California. We advise each one of the localities of the closest fallout report which would be applicable should fallout take place in in their area. Differences in points as close together as between stations in our wind network are not, in our opinion, very significant.

Mr. HOLIFIELD. In other words your wind current there, does it move north and south or east and west?

Dr. MACHTA. By and large the wind currents move from west to east.

Mr. HOLIFIELD. West to east?

Dr. MACHTA. Yes, sir.

Mr. HOLIFIELD. Then the same information goes to San Francisco that goes to Los Angeles.

Dr. MACHTA. Yes. In fact everyone of the cooperating stations in this network appears on the teletypewriter circuit and is picked up by every other Weather Bureau, CAA, and military weather station.

Mr. HOLIFIELD. Where does the basic information originate, does it originate at these stations or does it originate at a central station and go back to them?

Dr. MACHTA. It originates at each station which takes the upper wind observations.

Mr. HOLIFIELD. Do they send that information into a central location for screening and then play back?

Dr. MACHTA. No, sir. As the time approaches for them to put it on the teletypwriter they await their turn and each one in succession puts its information on the teletypewriter.

Mr. HOLIFIELD. I am trying to find out now if the people of San Francisco are depending upon their local San Francisco weather station for this prediction or are they depending upon the central bureau here in Washington?

Dr. MACHTA. The people in San Francisco are totally independent of Washington. They have two sources in San Francisco. One, they could call directly to the Oakland weather station and obtain the data or they could get it from an outlet on the teletypewriter circuit.

Mr. HOLIFIELD. But the teletype circuit originates in Washington; does it?

Dr. MACHTA. It covers the entire country. It has no point from which all the rest of the information is transmitted.

Mr. HOLIFIELD. It is composite reporting.

Dr. MACHTA. Yes, sir. The last few remarks which I have to make have largely been covered but may I present them?

Mr. HOLIFIELD. Go ahead. We would like to have them in order.

Dr. MACHTA. The present UF winds or fallout forecasts as we have been talking about them are merely an analysis of the latest wind observation. We recognize that the lack of true forecasting leaves room for improvement.

However, because of the nature of fallout winds the latest observation is a fairly good forecast for conditions many hours later. Thus fallout from the mushroom head of the nuclear cloud after 12 hours lies within an angle of about 10° of the UF predicted sector on the average. It is this mushroom head fallout which is dangerous far downwind. Further, the forecast sector is rather narrow—less than 20° in angular spread, on the average, in fact usually less than 10°, so that we can fairly accurately limit the sector of downwind hazard to a reasonably small angle out of the 360° around ground zero.

Mr. HOLIFIELD. At this point for the record it would be well to state if we are going to have any information of value to the civilian defense, it must be on the basis of at least daily or twice daily forecasts, by the station which has access to means of detecting in that particular area.

Dr. MACHTA. Yes, sir.

Mr. HOLIFIELD. At least twice daily.

Dr. MACHTA. In fact if we had our way those of us involved in civil defense would have reports four time a day.

Mr. HOLIFIELD. I see. Any civil-defense plans for any part of the day would of necessity have to take into consideration this information; would it not?

Dr. MACHTA. Yes, sir.

Mr. HOLIFIELD. And the plans would therefore vary with the wind direction——

Dr. MACHTA. Yes.

Mr. HOLIFIELD. When it came to the necessity of taking immediate shelter and the possibility of evacuation?

Dr. MACHTA. Yes. Even the use of the latest observation has its limitations because our upper wind observations frequently fail to reach the altitudes to which nuclear clouds can rise. This is normally not critical, if the wind observation reaches about 50,000 feet, since the winds above this level rarely enlarge the fallout sectors very much.

The Weather Bureau is conducting research to incorporate forecasting winds in the UF program. The most promising approach is the use of the wind forecasts up to 25,000 feet made at the Joint Numerical Weather Prediction Unit which employs a high-speed electronic digital computer.

This machine, used exclusively for meteorology, is producing forecasts which are competitive with conventional forecasts. If this procedure is successful, it may be preferable to compute both fallout areas and dosages at central locations and transmit the results via high-speed facsimile equipment to local civil-defense organizations.

Mr. BALWAN. Where is this located?

Dr. MACHTA. At Suitland, Md.

Mr. HOLIFIELD. You are talking about the use of one of the big IBM machines.

Dr. MACHTA. This is correct. We would adapt this forecast to also predict the necessary winds for civil defense.

Mr. HOLIFIELD. And would that be a service that could be obtained from a large machine centrally located or would you have to have a number of those machines?

Dr. MACHTA. My opinion would be that in order to be safe, one should have several such locations.

In the field of instrumentation, the Weather Bureau and the military services are developing techniques to reach 100,000 feet routinely for wind determinations.

Mr. HOLIFIELD. That, however, goes into the stratosphere.

Dr. MACHTA. Yes.

Mr. HOLIFIELD. And isn't it true as you have already indicated previously that our chief concern should be in ionosphere as far as local contamination is concerned? We had some testimony from Dr. Libby in which he indicated that a bomb of a 10-megaton force would pierce the stratosphere and he said a great deal of the radioactivity would therefore be dispersed widely in the stratosphere rather than falling out. At that point I clarified the record to the extent of questioning him about the 7,000 square mile pattern which he testified about.

He indicated that that was all from the portion of the radioactivity which remained in the ionosphere and which was spread by prevailing winds, down winds from Eniwetok. The point I am getting at is that we are really concerned chiefly with bomb yields which disperse their radioactivity in the ionosphere rather than the stratosphere.

Dr. MACHTA. May I state that actually the atmosphere is divided up into a troposphere, which exists from the ground up to about 30,000 feet in the temperate latitudes and above that the stratosphere. Dr. Libby's remarks, I should say, may have referred to the fact that most of the debris which falls out in the 7,000 square miles was located in the troposphere.

Mr. HOLIFIELD. I used the wrong word. I should have said troposphere.

Dr. MACHTA. There is at the moment a difference of opinion as to whether the fallout which occurred in the 7,000 square mile approximately in the first Pacific shot came from the troposphere or the stratosphere. It is our own opinion—this is purely an opinion since the data does not conclusively prove it—that the close-in fallout originates largely from the stratosphere. I would disagree in this case with Dr. Libby and therefore argue that we do require information from the stratosphere—to 100,000 feet or higher.

Mr. HOLIFIELD. In other words your wind current above 35,000 feet, you say is the troposphere?

Dr. MACHTA. The tropopause is at 35,000 feet in the temperate latitudes. In the tropics it is at about 60,000 feet.

Mr. HOLIFIELD. That is why he used 60,000 on the Eniwetok computation I guess. Your winds above that, they are not strong enough ordinarily to retain the dust at that altitude and cause it to circle the earth in a widely dispersed condition.

Dr. MACHTA. I think we are talking about two different items. One refers to those particles which are large enough to fall out within the first 18 hours or so. These will fall out irrespective of whether they are located below or above 60,000 feet. Those particles which are small and possess very small fall velocities will circulate around the world. These small particles largely reside in the stratosphere and it is these particles which have not yet fallen out. We may want to know when they too will fall out.

Mr. HOLIFIELD. But as far as your prediction is concerned of a fallout pattern, aren't you chiefly concerned with the fallout that occurs below 60,000 feet?

Dr. MACHTA. We are concerned with fallout from all levels up to, in this case, 80,000 feet. We are considering the possibility of fallout that is occuring from as high as 80,000 feet.

Mr. HOLIFIELD. Do you have information to show that the heavier particles do reach a height above 60,000 feet?

Dr. MACHTA. Can I answer the question slightly differently? In the case of the Nevada tests where we have very good information concerning the height at which the fallout particles originate, we do know that most of the large particles which fall out come from the mushroom head of the cloud.

The mushroom head is the large part of the nuclear cloud. The data which is available from the Pacific does not clearly indicate whether the particles that produced the large heavy fallout locally were or were not initially in the stratosphere. Our best guess from results which we get from the Nevada tests indicate that the close-in fallout comes from the mushroom head. In the case of the Pacific March 1 test, the mushroom head is above 60,000 feet. We are extrapolating from the Nevada tests to the Pacific tests in lieu of conclusive information about the Pacific tests.

Mr. HOLIFIELD. In your Nevada tests the mushroom does not go above 60,000 now?

Dr. MACHTA. That is correct.

Mr. HOLIFIELD. In fact it does not go above thirty-five or forty thousand now?

Dr. MACHTA. That is correct, sir.

Mr. HOLIFIELD. Of course, you are using small bombs there, you are using bombs in let us say roughly less than a hundred kilotons, whereas in these higher mushrooms, you are going then into the millions of tons.

Dr. MACHTA. Yes.

Mr. HOLIFIELD. So you have quite an extrapolation to make there from your Nevada tests to the Pacific tests, have you not?

Dr. MACHTA. Yes, sir. I may add that this viewpoint of placing most of the radioactivity which falls out close in originally in the stratosphere, above 60,000 feet, is held by almost everybody who has been working in the fallout business. There are only 1 or 2 exceptions to this and we are in this case going along with the majority opinion.

Mr. ROBACK. Do you mean that the Atomic Energy Commission is one of the few people who take exception to this prevailing view?

Dr. MACHTA. I would like to see what Dr. Libby has stated to see whether or not there is in fact any conflict. We do not feel that we disagree with the AEC on this matter.

Mr. ROBACK. Mr. Chairman, may we have a commentary by the Weather Bureau on Dr. Libby's testimony as it pertains to their understanding and findings in this field?

Mr. HOLIFIELD. Would you be willing to give us an opinion on his testimony if it were submitted to you?

Dr. MACHTA. By all means, sir.

Mr. HOLIFIELD. It is my opinion that his statement was clarified by questioning but it was ambiguous as first given, because it led to the conclusion that because the bomb force went into the stratosphere that a great deal of the radioactivity was dissipated widely and did not affect the surface.

Dr. MACHTA. This is true for the residual fallout, sir, not for the immediate fallout.

Mr. HOLIFIELD. But the immediate fallout is not fallout that goes into the stratosphere, it is fallout that is carried by the wind currents in the troposphere, is it not?

Dr. MACHTA. That is where there is a difference of opinion.

(The following supplementary statement was submitted by Dr. Machta:)

SUPPLEMENTARY STATEMENT OF DR. LESTER MACHTA

In the course of questioning by Representative Holifield of Dr. L. Machta on March 13, 1956, it appeared as though the testimony given by Dr. Machta was not in accord with that of Dr. Libby, who had testified before the Holifield committee on January 31, 1956. In response to a request for clarification of this item by Mr. Roback, director of investigations, the following commentary is offered.

The point in question deals with the likely origin of the large particles which produce the close-in fallout during the first several hours after a surface detonation of a nuclear device whose cloud reaches well into the stratosphere. Dr. Machta contended that these particles fall mainly from the stratosphere whereas it was Mr. Holifield's recollection that Dr. Libby's testimony placed these particles initially in the troposphere. The following testimony by Dr. Libby pertains to this question:

"Mr. HOLIFIELD. * * * It might be thought that the big weapons did not leave enough radioactivity in the tropopause to make them tremendously deadly in the radioactive sense.

"Dr. LIBBY. * * * You are correct. No, it is a fraction of it which is left downstairs, but this fraction is very dangerous.

• • • • • • •

"Dr. LIBBY. * * * that is, the material which falls out immediately within the first few hundred miles is not the material which generally goes into the stratosphere and fall right back down.

* * * * * * * *

"Dr. LIBBY. * * * Of course, some of the large local fallout may be in big particles which are lifted in the stratosphere which drop right back."

From the above comments by Dr. Libby one can readily understand Mr. Holifield's position. It is clear that the statements of Dr. Libby do not clearly and consistently argue that the close-in fallout originates in the stratosphere. Further, on March 15, 1956, Dr. Machta telephoned Dr. Libby to clarify this point. Dr. Libby agreed that a statement concerning the origin of the large particles which produce the local fallout as being mainly in the stratosphere was not in contradiction with either his testimony nor with his views on the matter.

In conclusion, therefore, the position which the Weather Bureau holds concerning the needs for wind observations at altitudes into the stratosphere because of the presence of large amounts of radioactivity in that layer which will fall out close-in is not at odds with the views of Dr Libby.

Mr. HOLIFIELD. All right, you may proceed.

Dr. MACHTA. The Weather Bureau is also conducting research for the Atomic Energy Commission and the Department of Defense leading to more reliable dosage estimates. The outcome of these studies can be directly applied to civil defense needs.

We should like to have our fallout forecasts viewed for what they are: rough estimates of areas and arrival times of fallout.

For preattack plans, they represent the only information a civil-defense director will have to guide him in estimating likely fallout sectors. As long as their limitations are appreciated, they should be invaluable. In the postattack phase, they are not intended to be a substitute for monitoring. However, if survey facilities are limited, the meterologist, with the UF winds or subsequent weather data, can tell where the monitoring teams should be vectored to obtain the measurements of radioactivity.

It should be pointed out that even if good forecasts are available but if ground zero is unknown the fallout area obviously cannot be estimated or in the case of a saturation attack it is rather irrelevant which bomb forces the population to take shelter.

Mr. HOLIFIELD. If there is a saturation attack, evacuation becomes dangerous if not impossible.

Dr. MACHTA. This is your view, yes. We as weather people would like to take no position on this issue.

Mr. HOLIFIELD. All right.

Dr. MACHTA. Our plans call for the continued operation of the UF fallout forecasting program since it does yield valuable estimates for the civil-defense official. We will continue our research and have every hope of improving both our observations of high altitude winds and predictions of fallout areas.

Mr. HOLIFIELD. Dr. Machta, we are very appreciative of your testimony, sir. If you have some other charts we would like you to just bring them up and explain them to us, because I see you have been there and the ones you have shown us are very interesting.

Dr. MACHTA. This is a picture (See Chart No. 6) of a typical high yield bomb cloud. The base of the mushroom head is 70,000 feet so the bulk of the volume of the nuclear cloud actually resides in the stratosphere.

(Chart No. 6 referred to appears on p. 622.)

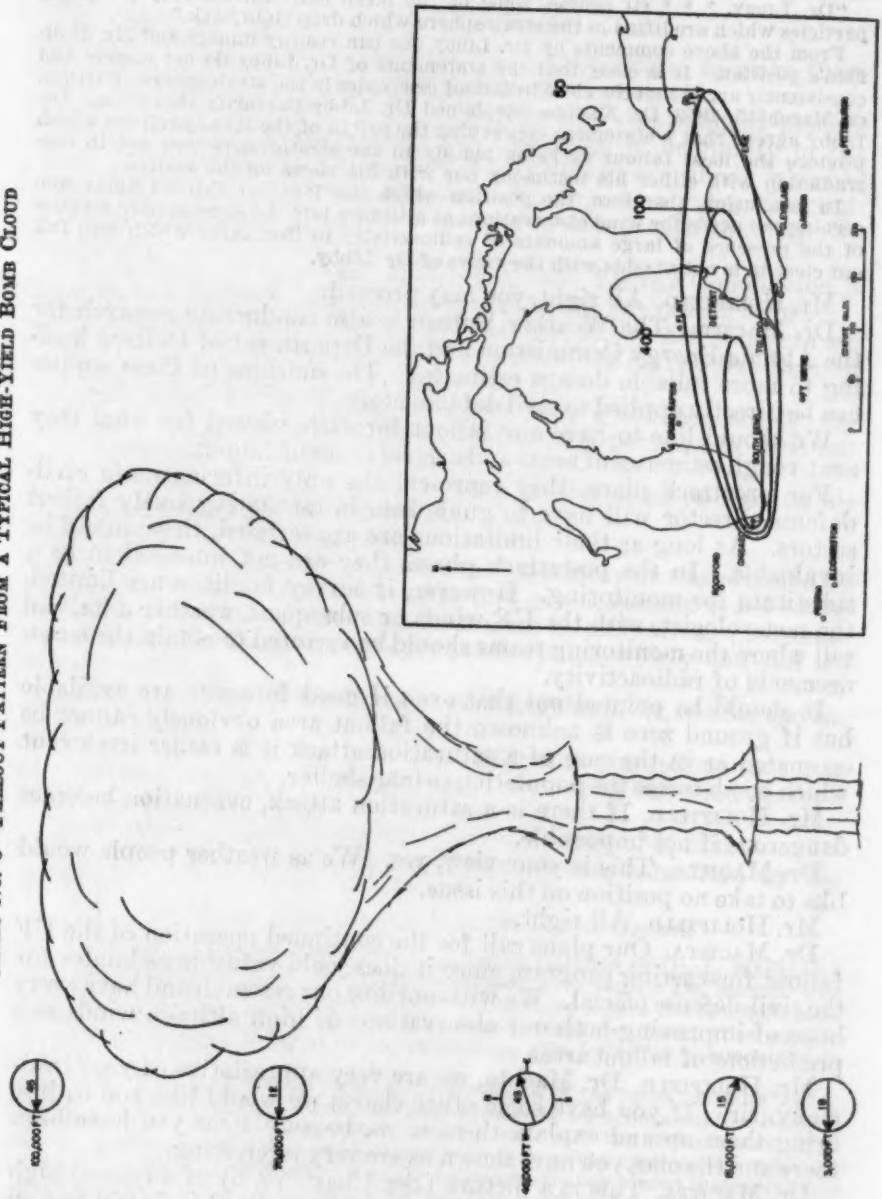


CHART No. 6—FALLOUT PATTERN FROM A TYPICAL HIGH-YIELD BOMB CLOUD

Dr. MACHTA. The division between the troposphere and the stratosphere in the case of the Pacific is at about 60,000 feet. It is our view that most of the radioactivity which actually falls out is in the mushroom head as opposed to the rather thin stem. The winds present in the case of the first shot are shown to the left, with the speeds shown as the numbers in miles per hour.

In the lowest level there are easterly winds which by 15,000 feet change to westerly winds and reach their maximum speed from the west at about 40,000 feet.

Then at the tropopause they change back to winds blowing toward the west and increase in speed up to 45 miles an hour at about 100,000 feet. These lines shown in the lower righthand corner of the figure are the isolines; lines of fallout intensities which resulted from the March 1 explosion. In this case, ground zero is hypothetically placed over Chicago, Ill.

The outer line which is 50 roentgens, effective biological dose, denotes a level of radioactivity at which some sort of countermeasure would have to be taken in order to avoid radiation hazards. The line labeled "100," which encloses Detroit, represents a dose which, if people were simply to stay outside, would produce some illness.

Mr. HOLIFIELD. You say "outside"; you mean out of doors?

Dr. MACHTA. Out of doors.

The line labeled "400" represents a dosage which, if no countermeasures were taken, would produce widespread deaths.

Mr. HOLIFIELD. That goes for how many miles?

Dr. MACHTA. A little under 200 miles.

Mr. HOLIFIELD. In other words, a downwind pattern of 200 miles for that size bomb would be lethal to everyone in that city, in that vicinity if they were not in shelter?

Dr. MACHTA. Yes. What I would like to show is what would happen.

Mr. HOLIFIELD. Let's go ahead and take those graduations before we leave this.

Dr. MACHTA. Yes.

Mr. HOLIFIELD. What happens? Is the next circle——

Dr. MACHTA. We have shown no additional circles. We have taken this information from a report from the AEC which has given only these three isolines.

Mr. HOLIFIELD. I know you have 50 roentgens. What distance is that?

Dr. MACHTA. The distance out, my guess would be about 400 statute miles.

Mr. HOLIFIELD. And of course 50 roentgens accumulated over several days at that rate would also be lethal.

Dr. MACHTA. No, sir. These numbers, 50 roentgens, represent accumulation over a long period of time. These are not dose rate but accumulated doses.

Mr. HOLIFIELD. Accumulation over what length of time?

Dr. MACHTA. About 30 days, more or less.

Mr. HOLIFIELD. But that would not apply to the 200-mile inside circle there, because your roentgens would be so high you would get your lethal dose in less than a day. You would probably get it in an hour wouldn't you?

Dr. MACHTA. Let's say 6 hours or something of that sort.

Mr. HOLIFIELD. I see.

Dr. MACHTA. What we are interested in showing is what kind of a pattern one would have gotten had we had a different wind field in this case.

Mr. RIEHLMAN. Before you leave that chart, I think I recall your saying in the stratosphere the bulk of the fallout still remains. You have an opposite direction of the wind, you have a wind blowing from the east to the west. What can we expect from the fallout of that great portion?

Dr. MACHTA. The particles which are originally in the upper part of the mushroom head would, as they descend, move westward, because the winds are blowing toward the west. However, as they fall down to the levels where the winds blow to the east, they would be carried eastward sufficiently so the ultimate point of deposition would lie to the east.

Mr. RIEHLMAN. That clarifies it.

Mr. BALWAN. The dangerous particles up there, the particles which pierce the troposphere, are they dangerous in the fallout?

Dr. MACHTA. Yes. It is our view that large particles, largely in the stratosphere initially break through the tropopause, and are deposited out on the ground.

Mr. BALWAN. Do we have any information on the percentage of particles that are in the head of the mushroom that come out through the tropopause? Or does 80 percent of that become part of the global fallout which takes 10 years?

Dr. MACHTA. I have the information, but I would like to have it checked for security by the AEC.

Mr. BALWAN. This was something Dr. Libby gave us. Where most of the particles in the head circulated in the global fallout and remained there for 10 years and are not dangerous.

Dr. MACHTA. Yes. All small particles which are in the stratosphere will remain there for a long time. All particles which are small and originate in the troposphere will be removed rather quickly by being rained out. This is the point I believe Dr. Libby is making.

Mr. HOLIFIELD. Is it not true that you have to know the surface composition, whether it is rock, sand, or dirt in order to know what you are faced with in the estimate of the size of the particles that do go into the mushroom?

Dr. MACHTA. Yes, sir; I believe you are correct.

Mr. HOLIFIELD. And we have no scientific data on the type of particles which would exist that would come from a large city like Chicago, because we did not have the detection instruments at Hiroshima and Nagasaki and those are the only cities that have been bombed that we had any record of.

Dr. MACHTA. There was very little fallout in the case of the attacks on Japan because they were air bursts. Consequently they would not have done any good anyway. There is some evidence that perhaps the type of soil or rock over which the explosion occurs may not be terribly important. But this evidence is not very strong.

Mr. BALWAN. There is a difference of opinion on that too.

Dr. MACHTA. It is more an absence of information rather than opinions.

In the upper left hand portion of the next picture are a series of isodose lines which have been copied from the isoline on the previous figure. They are from the March 1 test in the Pacific and to the left are the winds. What I would like to illustrate is some of the kinds of patterns we would get with the winds we observe in the United States (see Chart No. 7).

(Chart No. 7 referred to follows:)

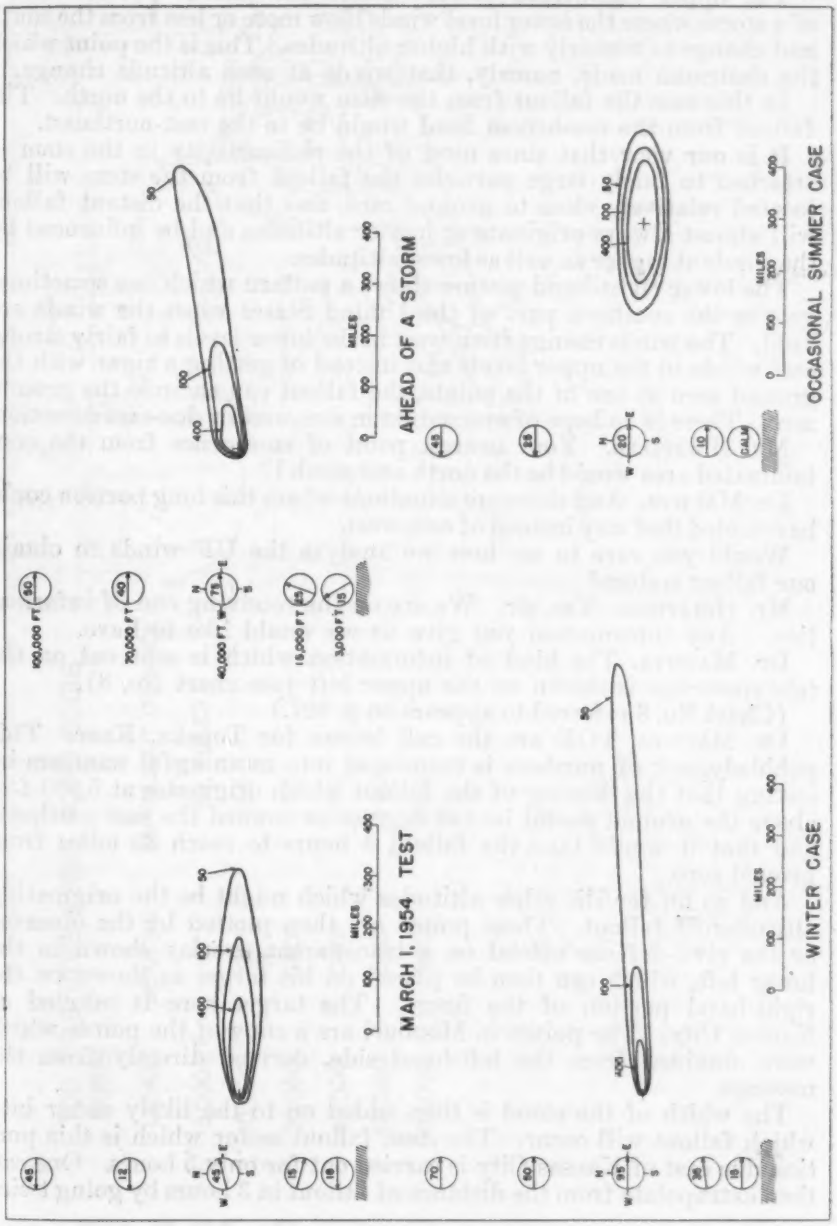


CHART NO. 7—HOW WINDS AND SEASONS AFFECT FALLOUT PATTERN

Dr. MACHTA. In the lower left is the kind of an isodose pattern one would get in the winter over the United States when we have west winds at almost all levels with quite high speeds especially in the region of a jet stream where the speeds might be over a hundred miles an hour in many cases. The pattern instead of being relatively wide and comparatively short like a cigar would be very elongated like a finger, narrow and long.

The upper right-hand picture shows the fallout pattern ahead of a storm where the lower level winds blow more or less from the south and change to westerly with higher altitudes. This is the point which the chairman made, namely, that winds at each altitude change.

In this case the fallout from the stem would lie to the north. The fallout from the mushroom head would lie to the east-northeast.

It is our view that since most of the radioactivity in the stem is attached to fairly large particles the fallout from the stem will be located relatively close to ground zero, and that the distant fallout will almost always originate at higher altitudes and be influenced by the winds at higher as well as lower altitudes.

The lower right-hand picture shows a pattern which one sometimes gets in the southern part of the United States when the winds are light. The winds change from west in the lower levels to fairly strong east winds in the upper levels and instead of getting a cigar with the ground zero at one of the points, the fallout can encircle the ground zero. There is no hope of evacuation in due-west or due-east direction.

Mr. HOLIFIELD. Your nearest point of emergence from the contaminated area would be the north and south?

Dr. MACHTA. And there are situations where this long portion could be oriented that way instead of east-west.

Would you care to see how we analyze the UF winds to obtain our fallout sectors?

Mr. HOLIFIELD. Yes, sir. We are on the receiving end of information. Any information you give us we would like to have.

Dr. MACHTA. The kind of information which is sent out on the teletypewriter is shown on the upper left (see chart No. 8).

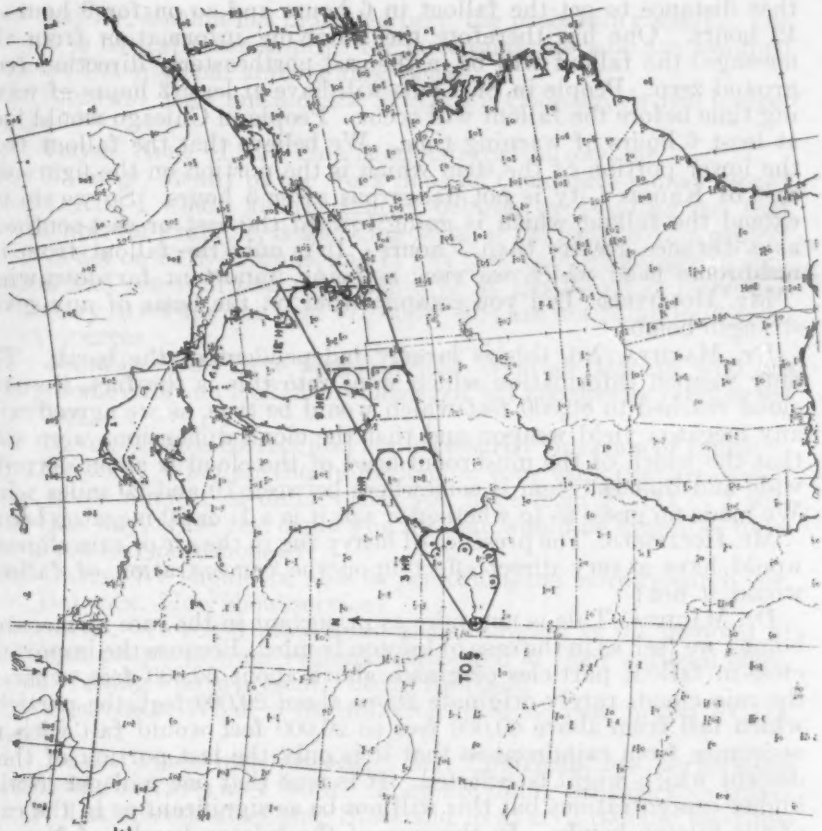
(Chart No. 8 referred to appears on p. 627.)

Dr. MACHTA. TOE are the call letters for Topeka, Kans. This gobbledygook of numbers is translated into meaningful numbers by stating that the bearing of the fallout which originates at 5,000 feet above the ground would be 110 degrees or toward the east-southeast and that it would take the fallout 3 hours to reach 80 miles from ground zero.

And so on for the other altitudes which might be the originating altitudes of fallout. These points are then plotted by the observer or the civil-defense official on a transparent overlay shown in the lower left, which can then be placed on his target as shown on the right-hand portion of the figure. The target here is selected as Kansas City. The points in Missouri are a copy of the points which were obtained from the left-hand side, derived directly from the message.

The width of the cloud is then added on to the likely sector into which fallout will occur. The stem fallout sector which is this portion due east of Kansas City is carried out for only 3 hours. One can then extrapolate from the distance of fallout in 3 hours by going twice

CHART NO. 8—DECODING AND PLOTTING A WEATHER BUREAU FALLOUT FORECAST MESSAGE



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that distance to get the fallout in 6 hours and so on for 9 hours or 12 hours. One has therefore the following information from this message: the fallout will be in the east-northeasterly direction from ground zero. People in St. Louis will have at least 3 hours of warning time before the fallout will occur. People in Chicago would have at least 6 hours of warning time. We believe that the fallout from the lower portion of the stem which is the portion on the figure due east of Kansas City is not dangerous after 3 hours. So we do not extend the fallout which is going toward the east or east-southeast at a distance greater than 3 hours. It is only the fallout from the mushroom head which we view as being important far downwind.

Mr. HOLIFIELD. Did you compute that on the basis of any given strength bomb?

Dr. MACHTA. No, this is largely independent of the bomb. The only weapon information which went into this is the fact, that the cloud reached to 80,000 feet which would be true, as we agreed with any megaton yield weapon and that the cloud dimensions were such that the width of the mushroom head of the cloud is about 40 miles wide and that the stem is somewhere between 10 and 20 miles wide. We made no guess as to whether or not it is a 1- or 20-megaton bomb.

Mr. HOLIFIELD. The presence of heavy fog in the air or rain showers would have a very direct effect upon the concentration of fallout, would it not?

Dr. MACHTA. This is not quite as important in the case of megaton bombs, we feel, as in the case of kiloton bombs. Because the important close-in fallout particles originate above about 60,000 feet, whereas the rain clouds rarely originate above about 20,000 feet, the particles which fall from above 60,000 feet to 20,000 feet would fall with no assistance from raindrops so that it is only the last portion of their descent which might be affected. It is true that one will get locally higher concentrations but this will not be as significant as in the case of the kiloton bombs. In the case of the kiloton bombs of Nevada we never fire when it is raining near the proving grounds so we do not have experience as to what would happen.

Mr. HOLIFIELD. The reason we do not fire is that we do not want that concentration of radioactivity. But an enemy might want to take advantage of weather conditions which we avoid in all these tests.

Dr. MACHTA. That is true, sir.

I believe that is all the material that we have.

Mr. HOLIFIELD. Any questions?

Mr. BALWAN. I want to ask a question. Has all this information been provided to FCDA?

Dr. MACHTA. Yes, sir.

Mr. BALWAN. And how recently have you had most of this information and your theories on fallout directions?

Dr. MACHTA. We have provided the information to FCDA for use at the local level since 1st of June 1955.

Mr. BALWAN. How much money does the Weather Bureau have to devote to work for the FCDA?

Dr. MACHTA. May I defer these questions to Mr. Davis? I am the scientist on the program, not the administrator.

Mr. DAVIS. We are operating this year on a total budget of $175,000 for support to the FCDA, $75,000 of that item is the climatological

study that Dr. Machta has indicated here, the probability study. The $100,000 is basically for salaries for meteorologists who are assigned to the FCDA national and regional offices.

Mr. BALWAN. How much of the $175,000 is Commerce's own budget money?

Mr. DAVIS. None of it. This is transferred money, sir.

Mr. BALWAN. Is any of the work done on Commerce money alone?

Mr. DAVIS. I would answer that, I believe, by pointing out that Dr. Machta, for example, is spending some of his time on this project and he is not on FCDA funds, and at any time that we engage in conferences and research and problems over at the Weather Bureau it is necessary to occupy the time of people who are not being paid from FCDA sources.

Mr. BALWAN. You have people at the Weather Bureau who are putting some effort on FCDA problems but not necessarily reimbursed by FCDA.

Mr. DAVIS. That is correct and not necessarily full time of course.

Mr. BALWAN. What are the limitations on your work that are caused by the given number of dollars that you have from FCDA? I will put it this way, what else could you do that would be desirable to be done if you had more money?

Mr. DAVIS. We should be able to perform some more research, sir.

Mr. BALWAN. How about service?

Mr. DAVIS. We could place more meteorologists at the disposal of the FCDA people at their regional offices and at their national office, the sort of thing we are presently doing for them.

Mr. HOLIFIELD. What is the function of these men in the FCDA offices?

Mr. DAVIS. These men presently, Mr. Chairman, are performing three basic functions as I see it. They are doing considerable travel with FCDA officials attending State and local civil defense meetings and at these meetings they are explaining some of the material that Dr. Machta has presented this morning, where you get this UF data, how you plot it, what you can do with it, how often it is available and that sort of thing.

In addition they are serving as staff meteorologists to the FCDA people themselves for the natural disaster work that the FCDA is doing. Recently in January for example, Mr. Chairman, when the floods hit northern California the second time, fortunately we had a Weather Bureau meteorologist at the FCDA regional office at Santa Rosa, Calif., and through the assistance that this man was able to provide personally, the FCDA officials were able to get to the scene of the flood and do some of their responsible functions more satisfactorily and more adequately.

This the the sort of thing that these regional meteorologists, as we call them, are doing for FCDA.

Mr. HOLIFIELD. Do they also in these different locations evaluate this fallout information and furnish daily plots or do they leave that to some subordinate?

Mr. DAVIS. As a matter of fact, they do it themselves and they have trained others in these regional FCDA offices to be able to plot out and follow the same techniques.

Mr. HOLIFIELD. When they are absent?

Mr. DAVIS. Yes, sir.

Mr. HOLIFIELD. On speaking engagements or educational tours?

Mr. DAVIS. Yes. As a normal routine, they are briefing the FCDA officials on fallout, natural disasters, floods, and that sort of thing.

Mr. BALWAN. Dr. Machta stated you give twice daily predictions on the teletypewriter and that it might be desirable to have four a day.

Mr. DAVIS. Yes, sir.

Mr. BALWAN. What is the limitation? Why aren't you giving four a day? Have you been asked for four a day?

Mr. DAVIS. We have not, thus far. But four a day, sir, would represent a tremendous increase in cost, and in addition it would require time on the teletype circuits which simply isn't available today.

Mr. BALWAN. How much money will it take in relative values, twice the amount that you have for that service or three times the amount, or do you need new capital construction to put out this service?

Mr. DAVIS. Obviously, sir, I am not prepared to give a quick answer that would be satisfactory to you. I would think aloud sir, that in terms of our present station activities it would not require a doubling of costs because some of those costs continue whether we are taking 2 observations a day or 4 a day. I think we might find that the increase in our operating costs—and if you please, this is a quick opinion—would be of the order of one to two million dollars if we were to double the number of upper air reports that we are getting from these upper air stations in the United States. This dodges the question of how you get the extra reports transmitted on communication facilities.

This would involve faster teletypewriter equipment than we presently have. We understand that the Civil Aeronautics Administration which actually handles the circuits for us in the Department of Commerce has plans for increasing the speed of the network from 75 words per minute to 100 words.

Mr. BALWAN. The military departments have their own circuits to transmit the data on this?

Mr. DAVIS. Yes.

Mr. BALWAN. Could the use of their circuits be helpful in doubling the number of daily forecasts that you make?

Mr. DAVIS. I am not prepared to answer, sir.

Mr. RIEHLMAN. I have one question, Mr. Chairman. Mr. Davis, would you care to comment on how effective the program is that Federal Civil Defense has in respect to using this type of data and information?

Mr. DAVIS. I have only limited information. I shall be happy to share that with you. We have checked with our meteorologist who is assigned to the national headquarters of the FCDA in Battle Creek and he has no actual count, but he mentioned to us as recently as yesterday that he believed that as he looked back on the tremendous work they have done with State and local people attending meetings and learning about this data, that it would be very conservative to say that 500 communities in the United States today are familiar with this data, that they are obtaining it and that they have been developing a potential for using it. This figure is an estimate sir, because he has not made a tabulation.

Dr. Machta mentioned the State of California, where we have specific information of the transmission to 154 communities, I believe. I could supplement that by reference to the State of New York, where a similar plan is now in operation. Doubtless there are others that we are not yet familiar with in the Weather Bureau.

Mr. HOLIFIELD. That would be a matter that we could find out by inquiry at the local level.

Mr. DAVIS. Yes; the Weather Bureau I am sure could undertake a survey without too much difficulty to find out from its officials to whom they are supplying this data.

Mr. HOLIFIELD. It would be interesting to know whether this information is being actually used to plot a fallout pattern upon receipt, so that if an emergency should occur it would have current information plotted and ready to transmit to the operating bases or whether it is being received in a more or less informal way and not much attention being paid to it.

I suppose that would vary with the efficiency of the local organizational setups.

Mr. DAVIS. I should think so; yes.

Mr. HOLIFIELD. It would be interesting to know if you do have that information or can obtain it, to give this committee that information, without too much trouble, we would appreciate having it. Your nine regional men report to what extent they of their own knowledge know this is actually being used in local plans?

Mr. DAVIS. We would be happy to undertake to get some information like that for this committee.

Mr. HOLIFIELD. I notice in your dealings in relation to plan No. 5 of 1950 that you are supposed to prepare analyses of past data, conduct research, and develop techniques and capabilities leading to improved forecasts of radiological fallout patterns and I assume that you have done that and I want to ask you this question: When did you start giving this information to these local areas?

Mr. DAVIS. I believe that goes back to June 1 of 1955, Mr. Chairman. Since that time it has been available all over the United States.

Mr. HOLIFIELD. You are also supposed to make these probable fallout patterns for the target areas and, as I understand it, this is to be made after consultation with such data as you have back over a period of several years.

How many of these primary target areas have you furnished with radioactive fallout patterns for the complete year?

Mr. MORGAN. As to the Detroit area which you illustrated.

Dr. MACHTA. We furnished them to none of the cities as yet. We will have data enabling us to furnish them to every single target in the United States. But as yet we have not completed this study.

Mr. HOLIFIELD. When do you estimate they will be ready for these cities to use?

Dr. MACHTA. Well, we will have information on the likelihood of fallout if it should occur in the summertime ready by May 15. If the fallout should occur in fall, by June 15. The winter study will be finished between July 15 and August 1, and the spring study will be finished by September 1, 1956.

Mr. HOLIFIELD. You are safe in saying then that you will have this information this year to all of the principal target areas?

Dr. MACHTA. Yes, sir.

Mr. BALWAN. That is part of your climatological study?

Dr. MACHTA. Yes, sir.

Mr. RIEHLMAN. Getting back to my question then, of course, the committee must understand that a lot of the information on the charts that we have seen this morning, apparently are not in the hands of the local civil defense directors.

Dr. MACHTA. The probabilities study was indicated as being a hypothetical pattern of what we hope to show to people. It is not in the hands of anyone.

Mr. HOLIFIELD. In other words you are showing us what you are going to do by the end of this year, the type of patterns you are going to furnish these people.

Dr. MACHTA. Yes.

Mr. RIEHLMAN. We are not in a very good position to ask questions as to how effective this is and how well they are bringing that to the attention of the civilians in their areas, are we?

Dr. MACHTA. As far as the probabilities study is concerned the answer is "No." As far as the day-by-day operations, this is an operation that can be done.

Mr. HOLIFIELD. Will you clarify just what you mean by that? In other words you are giving them the information twice a day so that they can plot their own fallout patterns?

Dr. MACHTA. Yes.

Mr. HOLIFIELD. But you are not giving them the historical backgrounds which would enable them to ascertain in advance the probability of a type of pattern that might occur at a certain time.

Dr. MACHTA. That is the correct interpretation.

Mr. MORGAN. Mr. Davis, has the FCDA consulted any of your men in the regional offices prior to their dispersal or evacuation planning?

In other words are they making use of the information that is available to them now in their planning, I mean evacuation and dispersal plans.

Mr. DAVIS. I don't have the information to answer that question, sir.

Mr. HOLIFIELD. Are there any further questions of these gentlemen?

Mr. ROBACK. I would like to ask a question, Mr. Chairman. First I would like to ask Mr. Davis, are you operating under thre delegations from the FCDA?

Mr. DAVIS. It is delegation No. 3 as I recall it.

Mr. ROBACK. Do you have three delegations which are in effect or does one supersede another?

Mr. DAVIS. No; I don't know of anything superseding anything else. There are two parts in the delegation and I have a copy of them here.

Mr. ROBACK. I would like to request, Mr. Chairman, that all of the delegated authority, that the Weather Bureau operates under, its terms of reference, be submitted for the record and join to that a brief statement the extent to which the delegation has been complied with and the reasons if any why the delegation has not been complied with.

Mr. DAVIS. Yes, sir.

Mr. HOLIFIELD. If it happens to be lack of funds or whatever the cause may be—thank you very much.

If you will submit that to the staff, we will be glad to have it for our records.

(The material referred to follows:)

STATEMENT CONCERNING CIVIL DEFENSE RESPONSIBILITIES DELEGATED TO THE UNITED STATES WEATHER BUREAU

Effective August 13, 1955, the following-described responsibilities were delegated to the Secretary of Commerce, who in turn redelegated them to the Weather Bureau:

"Prepare analysis of past data, conduct research, and develop techniques and capabilities leading to improved forecasts of radiological fallout patterns.

"Prepare and issue currently, as well as in an emergency, forecasts and estimates of areas likely to be covered by fallout as a result of enemy attack. Such information is to be made available to Federal, State, and local civil-defense authorities for public information."

This delegation of authority served to formalize responsibilities which the Weather Bureau had gradually assumed, in its dealings with civil-defense authorities, since the potential dangers of radioactive fallout first became known.

Special studies on the transport of atomic debris in the atmosphere were conducted and published in 1954 and 1955, before responsibilities for the studies had been formally delegated to the Weather Bureau. One study entitled "Winds and Fallout: A Climatological Appraisal," was published in June 1955 and was distributed widely by the Federal Civil Defense Adminstration. Similar studies are currently underway. One of them, which has been described in our statement to the subcommittee on March 13, 1956, is a climatological study of 5 years of daily upper wind data, from which probabilities of fallout, on a geographical basis, may be determined, and the average number of hours after the bomb drop before the fallout would begin.

Other areas of reasearch include the development and use of electronic computers to predict areas of expected fallout, and radioactive dosages. The Weather Bureau is conducting research with a high-speed electronic digital computer to improve its forecasts of fallout areas. In addition, it has provided direction for the National Bureau of Standards in the development of an electronic analogue fallout computer, which it hopes will eventually become available to active civil-defense communities. The Weather Bureau is also conducting research for the Atomic Energy Commission and the Department of Defense on dosage estimates which is currently applicable to civil-defense needs.

Current forecasts of areas likely to be covered by fallout as a result of enemy attack have been prepared twice daily since June 1, 1955, at numerous Weather Bureau stations in the United States. The program began with a 34-station network which was enlarged on February 1, 1956, to 52 stations. The forecasts are tarnsmitted by teletypewriter circuit throughout the entire country. There are over 500 drops on this circuit, thereby insuring wide distribution of the forecasts. Weather Bureau officials have contacted local and State civil-defense agencies in their areas, and have advised them of the availability of the forecasts, how they are to be used, and the like. In addition, some State civil-defense agencies are retransmitting the fallout forecasts on their own State communication facilities. To further the distribution and use of these forecasts, the Weather Bureau has assigned nine experienced professional meteorologists to the national and regional offices of the Federal Civil Defense Administration. These men travel in the various FCDA regions where they address local and State civil-defense groups on fallout problems, assist them in learning how and where to obtain the forecasts, and how to use them.

In its efforts to provide forecasts of fallout areas, the Weather Bureau has recognized that fallout resulting from detonation of nuclear bombs over Canadian targets might fall on United States soil and constitute a real hazard. Accordingly, plans for Canadian participation in the fallout forecasting program have been worked out and agreed to by the meteorological services of the two countries. These Canadian forecasts will be transmitted by the same teletypewriter circuit which carries the forecasts from United States locations, and will be

available throughout the United States at all of the more than 500 locations having drops on the circuit. The new program will get underway just as soon as the Canadian Meteorological Division can get out final operating instructions to its stations which are to participate.

Fallout forecasts are also prepared by the Weather Bureau in the Territory of Hawaii and will be available in Alaska by no later than April 1, 1956.

(The preceding statement was prepared by Dr. Lester Machta, Chief, Special Projects Section, and J. J. Davis, Civil Defense Coordinator, United States Weather Bureau, Washington 25, D. C., as requested by the Military Operations Subcommittee of the Committee on Government Operations on March 13, 1956.)

Mr. HOLIFIELD. Are there any further questions?

If not, we will thank you gentlemen again for your very fine testimony and we appreciate the time that you have given us and excuse you at this time.

Our next witness is Mr. C. D. Curtiss, Commissioner of the Bureau of Public Roads; Mr. Curtiss, if you will take the witness stand and any of your assistants which you wish to have by your side during this presentation for any reason why you may also invite them to come forward.

You have a prepared statement I see, Mr. Curtiss. Would you like to proceed with it?

STATEMENT OF C. D. CURTISS, COMMISSIONER, BUREAU OF PUBLIC ROADS; ACCOMPANIED BY FRED E. SCHNEPFE, ASSISTANT TO THE COMMISSIONER, BUREAU OF PUBLIC ROADS; AND P. A. CARMICHAEL, CHIEF, CIVIL DEFENSE PROGRAM, ASSISTANCE BRANCH, BUREAU OF PUBLIC ROADS

Mr. CURTISS. Pursuant to the authority contained in section 201 (b) of the Federal Civil Defense Act of 1950, the Administrator of the Federal Civil Defense Administration, with the approval of the President, delegated to the Secretary of Commerce certain authority and responsibility for assisting in accomplishing the objectives included in the act.

The following four items under FCDA delegation No. 2 were redelegated by the Secretary to the Bureau of Public Roads:

1. Provide advice and guidance to State highway departments in the designation of State civil-defense emergency highway routes.

2. Coordinate interstate and State designated civil-defense highway systems to assure uniformity of designation for civil-defense emergency purposes.

3. Plan a national program, develop technical guidance for States, and direct Federal activities concerning emergency clearance and restoration of highways, streets, and bridges in damaged areas.

4. Provide technical guidance to States concerning highway traffic-control problems which may be created during a civil-defense emergency.

A further description and clarification of the responsibilities of Public Roads under delegation No. 2 are contained in a memorandum of understanding between FCDA and Public Roads. Following are certain excerpts from that memorandum setting forth the objectives of the program contemplated under the delegation.

1. Provide technical guidance oncerning evacuation planning and highway traffic regulation and supervision problems which may be

created during a civil-defense emergency. The cooperation of the State highway departments, the police, the trucking, bus and transit industries and others will be enlisted in the development of methods and procedures for such planning.

2. Provide technical advice and counsel to States, counties, and cities on the designation of routes for emergency civil-defense highway use.

3. Consolidate regional networks of routes for emergency civil-defense highway use into a national network after consultation with representatives of FCDA and the Department of Defense.

4. Bring about standardization of signs needed for designation of routes for civil-defense emergency use.

5. Review and revise the FCDA technical manual on "utilization and Control of Streets and Highways in Civil Defense Emergencies" and the one titled "Clearance and Restoration of Streets and Highways in Civil Defense Emergencies," to reflect changes which have occurred since the manuals were originally prepared by the Bureau of Public Roads for FCDA.

6. Coordinate Federal activities concerning emergency clearance and restoration of highways, streets and bridges in damaged areas, following enemy attack.

7. Coordinate directly with other Federal agencies concerned with the four points outlined in section II of this memorandum.

Also, under the authority cited above, the Administrator of the Federal Civil Defense Administration, with the approval of the President, delegated to the Secretary of Commerce additional responsibilities which are included in the FCDA delegation No. 3, dated August 13, 1955. From this delegation the Secretary redelegated the following item to the Bureau of Public Roads, which reads as follows:

Determine and evaluate, with the cooperation of the States, counties, and cities, and assist in the planning of the needs for highway improvements to meet civil-defense requirements.

Delegation No. 3, which is contained in a statement consisting of 1 sentence, requires separation into 2 parts for clarification, and can be described as follows:

1. Determine and evaluate with the cooperation of the States, counties, and cities, the needs for highway improvements to meet civil-defense requirements; and

2. Assist in the planning of the needs for highway improvements to meet civil-defense requirements.

Soon after the issuance of delegation No. 2, in September 1954, Public Roads was advised by the Office of the Secretary of Commerce that certain responsibilities under this delegation would be redelegated to the Bureau of Public Roads. Accordingly, the necessary instructions were issued for activating this assignment.

Although funds needed for carrying on this work had not been provided, in the light of the basic responsibilities and closely related normal activities of the Bureau of Public Roads to the tasks outlined in the delegations, preliminary studies were undertaken through part-time assignments to members of the regular staff, in order that no time would be lost in getting started.

Following congressional hearings, which pointed up the urgency of this activity, a task force was organized for the purpose of evaluat-

ing the technical problems involved in order to establish the proper basis for taking action for prosecuting the work at such time as funds might become available. The members of the task force worked a period of 30 days and then returned to their regular duties.

Not until August 1955 did any funds become available to Public Roads from FCDA and then only $70,000. In its budget request, FCDA asked for an appropriation sufficient to enable Public Roads to carry out the responsibilities that had been delegated to that bureau.

The allotment of $70,000 was made from the sum appropriated by Congress to FCDA for financing the work of the several agencies who had received FCDA delegations.

In view of the limitation of funds, it was necessary to determine what part of the work should be carried on first, and what would of necessity have to be deferred. It was decided to concentrate on that part of delegation No. 3 dealing with the study of the needs for highway improvements, this study having been requested by the chairman of the Subcommittee on Civil Defense of the Committee on Armed Services, and the chairman of the Subcommittee on Public Roads of the Committee on Public Works, both of the Senate.

As is was found that the $70,000 allotment would be insufficient for making the study and report, the FCDA made an additional allotment of $50,000 in December 1955, which provided a total of $120,000.

Although operations have been greatly retarded and the program of activities drastically revised, definite progress has been made. It should be pointed out that the problems assigned to Public Roads have been under study for more than a year, not only by those assigned full time to this work but also to other members of our staff on a part-time basis. As a consequence, this bureau has developed a background of information in this field which should prove of value in a continuance of this operation.

With the knowledge that firm financing had been established by the passage of the Supplemental Appropriation Act of 1956, the Office of Civil Defense Program Assistance was established in the Bureau of Public Roads.

Mr. Carmichael is head of that branch.

This unit operates under the Office of the Assistant to the Commissioner and has the organization status of a branch unit within the Bureau.

The task on which all of the efforts of this office are presently being concentrated is the preparation of a report on the needs for highway improvements to meet civil-defense requirements. That report is now in rough draft form.

As usual, Public Roads called on the State highway departments to assist in this undertaking.

I would like to say gentlemen, without their help we could not have accomplished what we have thus far, little as it may be.

Through their wholehearted cooperation, the field material was collected and reports submitted. These reports formed the basis for the analysis being made in our Washington office, and on which the report will be based.

The forthcoming report is expected to indicate the effects of highway capacity improvements on civil-defense evacuation requirements nationwide, rather than to provide precise details of the kind neces-

sary for the formulation of individual area road improvement programs.

Special detailed inspections of individual routes will be necessary in planning and estimating the cost of highway improvements in specific target areas, and it's intended that such programs be prepared as a part of survival planning which is now being undertaken by the FCDA.

The Bureau's report will indicate how highway capacity improvement expenditures will reduce target area evacuation time requirements or permit the evacuation of an area's population to a greater distance within the limits of various possible warning periods.

While no new research techniques have been developed solely for civil-defense purposes, data developed by the Bureau of Public Roads in cooperation with State highway departments, and others, on such elements as traffic capacities, highway use, and uniform highway signs have been used.

Such techniques are basic to evacuation planning, and the full utilization of the highway systems in an emergency. For the purposes of carrying out the determination of highway needs for civil-defense purposes, a number of these techniques were correlated into a manual in a manner suitable to achieve the basic objectives of the study.

As previously stated, items 1 and 2 under delegation No. 2 require that Public Roads—

1. Provide advice and guidance to State highway departments in the designation of State civil defense emergency highway routes.

2. Coordinate interstate and State designated civil defense highway systems to assure uniformity of designation for civil defense emergency purposes.

For some time prior to the issuance of delegation No. 2, FCDA had been concerned with the need for technical guidance to States, cities and local governments in the identification of a civil defense network of highways, local, State and interstate in character, for mobile support and evacuation.

The request to Public Roads to assist in this matter culminated in an agreement between the Administrator of FCDA and the Bureau of Public Roads, which was signed on April 14, 1954.

The agreement, which is quite short, reads as follows:

I. PURPOSE

To utilize the experience and technical knowledge of the Bureau of Public Roads and its cooperative relation with the State highway departments in securing the designation of various highways as State, regional and national civil defense emergency routes.

II. AUTHORITY

Pursuant to the authority contained in section 405 of Public Law 920, 81st Congress, as amended, and Executive Order 10346, April 18, 1952, the Federal Civil Defense Administrator has reached an agreement with the Commissioner of the Bureau of Public Roads whereby the Bureau will undertake the following civil defense advisory responsibilities in connection with the development of this program.

III. ADVISORY RESPONSIBILITY OF BUREAU OF PUBLIC ROADS

1. The provision of necessary advice and counsel to State highway departments in the designation of State civil defense emergency highway routes.

2. Coordination of interstate and State designated civil-defense systems to assure "uniformity of designation" for civil defense emergency purposes.

IV. SUPPLEMENTS

Should more detailed explanations of the intent or procedures under this agreement be necessary, such explanations will be issued pointly by FCDA and the Bureau of Public Roads as supplements to this agreement.

Copies of this memorandum of understanding were distributed by FCDA to the State and local civil defense directors accompanied by its Advisory Bulletin No. 167, dated May 18, 1954.

Likewise the Commissioner of Public Roads transmitted both documents to the Deputy Commissioners and division engineers with a memorandum dated June 3, 1954. An excerpt from his memorandum reads as follows:

At the request of the Federal Civil Defense Administration the Bureau of Public Roads has agreed to provide advice and counsel to State highway departments, when requested, in the designation of various highways as State, regional and national civil defense emergency routes, and assist in the coordination of such routes to assure "uniformity of designation" for civil defense emergency purposes.

Thus, the assistance of Public Roads, which had already been secured by agreement, was included in delegation No. 2 for convenience.

Work under this agreement is of an advisory nature, and has proceeded without difficulty.

The first step under item 3, delegation No. 2, concerning emergency clearance and restoration of highways, streets and bridges in damaged areas requires the writing of a manual. Such a manual is now under preparation and when completed will provide such information on organization, methods and procedure as will furnish a basis for the planning of a national program.

The meaning of item 4 as described in the memorandum of understanding is—

To provide technical guidance concerning evacuation planning and highway traffic regulation and supervision problems which may be created during a civil-defense emergency * * *

Our work on this item is presently limited to that phase related to the report now being prepared regarding highway needs for civil defense.

The technical problems involved have been under study for more than a year.

Public Roads did not seek the assignments embodied in the delegations; however, we realize the assignment is a logical one and those in our organization who are engaged full time or part time in this effort have been advised that this assignment is to receive the same attention as any of our regular Federal Aid highway responsibilities.

The Bureau of Public Roads realizes fully the seriousness and importance of this assignment, and that we are giving it our best efforts.

Mr. HOLIFIELD. Mr. Riehlman?

Mr. RIEHLMAN. Mr. Chairman.

Mr. Curtiss, how many people do you have assigned to this responsibility?

Mr. CURTISS. Ten at the present time.

Mr. RIEHLMAN. And their salaries are being paid by the Federal Civil Defense?

Mr. CURTISS. From the funds transferred from Federal Civil Defense. They are working under Mr. Carmichael.

Mr. RIEHLMAN. Mr. Carmichael then would have certain direction over their activities?

Mr. CURTISS. That's right. And he is working under Mr. Schnepfe's general direction.

Mr. RIEHLMAN. You have no direct authority. Your activity in this field would be that of coordinating certain programs with the States and different localities throughout the United States. Is that correct?

Mr. CURTISS. I think that is correct.

Mr. RIEHLMAN. You have to have the cooperation from the local State highway department.

Mr. CURTISS. Yes, sir.

Mr. RIEHLMAN. And certainly from the cities and counties as to what your program is going to be.

Mr. CURTIS. Without their help, it would be very difficult to carry out any of this work.

Mr. RIEHLMAN. Maybe Mr. Carmichael can answer this question. Other than the construction of signs designating certain highways as those to be used in case of an attack for evacuation purposes and for military purposes, how far have you really advanced in this program of coordination with the states and localities?

Mr. CARMICHAEL. Well, as the Commissioner has said, we are now engaged in the preparation of this report on civil defense highway needs and in fact have advanced it to the rough draft stage.

And that has been occupying most of our time for the last 4 months.

Mr. RIEHLMAN. Well, the committee I am sure would be very interested in knowing something of the nature of that report that you are getting up.

Mr. CARMICHAEL. As was said in the Delegation No. 3, the report is designed to answer the question on the amount of benefits that would be derived from highway improvements to selected civil defense evacuation routes in the matter of increased capacity and therefore would exercise an effect on the amount of time required for evacuation of a given target area.

Mr. RIELHMAN. Would it have any recommendations for new highways and construction of highways?

Mr. CARMICHAEL. I don't know that.

Mr. SCHNEPFE. It is not contemplated that we will include actual recommendations as to what should be done. Our effort will be to present the facts as based on the study as we see them.

Mr. RIEHLMAN. With what highways we now have.

Mr. SCHNEPFE. And what additional highways that might be needed in order to bring about more rapid evacuation.

Mr. RIEHLMAN. That answers my question to some degree.

Mr. HOLIFIELD. Will you yield on that?

Have you actually made a study of the principal target areas, military designated target areas of our nation in regard to this project of yours, this delegation?

Mr. SCHNEPFE. No detailed studies have been made of any of the areas. We took the FCDA target areas as the basis for our work. What we were trying to get at was some dollar estimate of what might be needed throughout the country to obtain evacuation based on different time periods, and in collecting the information no study on the

ground was made of any highway improvements that might be necessary to produce that.

Mr. HOLIFIELD. How could you make a study—and let us just choose the city at random, let us take the city of Chicago—how could you make a study to ascertain the dollar need for improvements unless you made a study which would take into consideration the existing network and the vulnerable points of traffic obstruction, such as bridges and other impediment, the number of roads of egress, the probable pattern of radioactivity and these other pertinent matters in regard to that particular target area.

Mr. SCHNEPFE. Mr. Chairman, I stated that we did not make an "on-the-ground" study. By that I mean to say that an inspection was not made of the physical facilities. However, in collecting the information for analysis, through the State highway departments with the assistance of public roads field engineers, and no doubt in many cases through the cooperation of the cities, the information was obtained from men who are familiar with the highway improvements needs. The first step consisted of indicating on a map of the area those routes that would lead from the city to points 15, 25 and 40 miles out.

From the information which they already had the engineers estimated what might properly be expended to improve the facilities to meet civil defense requirements.

For instance a highway might have a section of adequate width, then a narrow section, followed by another wide section. An estimate would be made for bringing the narrow section up to an adequate width.

It is in the nature of a nationwide estimate indicating what might be involved in getting various degrees of evacuation, dollarwise, according to different time periods.

Mr. HOLIFIELD. What was the purpose of obtaining this information?

Mr. SCHNEPFE. It developed in the hearings before Senator Kefauver's Subcommittee on Civil Defense about a year ago, when he indicated that while the planning that we proposed doing at the request of FCDA appeared to be adequate and proper, there was nothing included in the memorandum of understanding regarding Delegation No. 2, that would indicate what thinking there is with regard to building highways specifically for civil defense purposes, and primarily for evacuation. That brought forth a request to Governor Peterson to ask public roads to make such a study, and the issuance of Delegation No. 3 followed.

Mr. HOLIFIELD. As I understand your study has been made on the basis of information which has been furnished you by the State road departments or your county or your urban metropolitan area, road departments, is that right?

Mr. SCHNEPFE. Yes.

Mr. HOLIFIELD. How many of those have furnished you that information?

Mr. SCHNEPFE. All of the 48 States.

Mr. HOLIFIELD. All of the States have furnished you the information?

Mr. SCHNEPFE. Yes, sir.

Mr. LIPSCOMB. Wouldn't those lists, which would be the deficiency lists, be the same they submitted to the Public Works Committee on the highway bill?

Mr. CURTISS. Not necessarily, because they wouldn't be segregated in that way. We built the section 13 report up by systems, the cost of improving the systems to an adequate standard and that came to $101 billion.

Mr. LIPSCOMB. Isn't one of principal things that we are discussing in the highway bill the need for roads for civilian defense, which includes evacuation?

Mr. CURTIS. That is one phase of it; yes.

Mr. LIPSCOMB. How will your report tie into the work that is being done on the highway bill, the need for adequate highways for civilian defense?

Mr. CURTISS. The Federal-aid highway program is restricted to designated systems of highways. That is we have the primary system in rural and urban areas. That consists of about 234,000 miles. We have the secondary system and its extension into and through urban areas. That consists of about 507,000 miles. So we have a total of about 740,000 miles. We have a multiplicity of city streets that would be involved in this other study that are not eligible now in any way for improvement with Federal-aid funds. This new program that emphasizes the Interstate System would provide some very important highways that could be used for evacuation.

There are about 6,000 to 7,000 miles of the Interstate System that are in urban areas, either radial or circumferential routes.

Mr. LIPSCOMB. How current is your report going to be in view of the fact that we are thinking in terms of trying to get a highway bill out at this particular time? Shouldn't the civilian-defense needs and other needs for highways and streets be considered concurrently?

Mr. CURTISS. They are.

Mr. LIPSCOMB. Might not your report show that we might supplement the highway bill; that we don't have adaquate civil defense?

Mr. CURTISS. It might well do that. There might be needed improvements to remove the short bottlenecks that are not now a part of the Federal-aid system.

Mr. LIPSCOMB. Has the Bureau of Public Roads done any research into the present highway bill that has been talked about to see whether it is inadequate before we pass it in the present session of Congress?

Mr. CURTISS. We think that it is adequate; the provision—I am speaking of the House bill now.

Mr. LIPSCOMB. Is it adequate in view of the civilian-defense needs of our country?

Mr. CURTISS. Consideration, when this report and the survival planning report is completed, may require further legislation, but it would supplement and not make unnecessary anything that is provided in the present highway bill.

Mr. LIPSCOMB. One of the things that seem important to me in the passage of the highway bill is the need for adequate highways for civil-defense and military-defense purposes, and I should think the studies would be pretty well along or else the bill we are talking about isn't adequate or has not had adequate study.

Mr. CURTISS. Everything provided for in that bill is needed very much and will contribute to civil defense but it is not necessarily the complete answer.

Mr. ROBACK. Can the question be formulated this way: What difference would civil-defense requirements have made in your presentation of the public-roads bill? Has it made any difference in your presentation?

Mr. CURTISS. No, I don't think it made any difference. We were directed by the Congress to report on the cost of bringing to a satisfactory standard all the roads and streets in the whole country; some 3,300,000 miles. That was included in the section 13 report and it was divided among 10 different categories of systems beginning with the interstate and the primary and secondary and so forth.

Mr. ROBACK. So it is fair to conclude from that statement that, while all highway improvements are helpful to civil defense, there was no specific civil-defense planning in the highway bill. Is that a fair construction?

Mr. CURTISS. Well, it was recognized that any highway improvements in urban areas would contribute to civil defense, particularly the Interstate System improvements which will provide wide rights-of-way where streets would not be blocked by demolished buildings.

I know at one time the military favored these wide streets so that they would not be completely blocked by bombed-out buildings. We think the wide streets are still necessary for our peacetime economy, but the question of evacuation, after listening to earlier testimony, seemed to make the warning time or the alert time pretty important and significant.

Mr. LIPSCOMB. Did the list that you received from the States for your study in civilian defense differ any from the deficiency lists previously submitted by the States for your road-bill information, or were you working from the same list?

Mr. CARMICHAEL. You see, we have certain items of improvements that are shown in the report submitted by the States that are definitely associated with the previous highway-needs estimate made. So we have a capacity-improvement figure for improvements that are also included as normal traffic requirements and that are included in the section 13 study of 1954, and then we have additional requirements that are not essential for normal traffic (the estimate of normal traffic of the next 10 years), and they will be shown separately and reported separately.

Mr. LIPSCOMB. Then in making your report did you put a different priority on that deficiency list that was submitted to you? Did you specifically pick out highways for civilian-defense purposes?

Mr. CARMICHAEL. No different priority. All the routes selected for evacuation purposes were shown on the map for each target area and they were qualified for selection as an evacuation route.

If they gave egress to 1 of the 3 screen lines, bounding the 3 zones, 15 miles, 25 miles and 40 miles, and those routes were included, then they were appraised for their capacity and the maximum traffic capacity that could be obtained on those selected routes was in effect priced, and they were classified as minor improvements and major improvements, and all minor and major improvements of the type defined in

our manual of procedure were estimates that had been included in the section 13 estimate of 1954 for general highway needs.

Then we had what we call a new-lane category of improvement that definitely was not required for normal traffic needs but would be required for betterment of evacuation traffic capacity if evacuation of a given target area and its population were to be accomplished in a specified number of hours.

So, you see, our data will be broken up as between those improvements that are also normal traffic requirements and those that are required purely for evacuation purposes.

Mr. LIPSCOMB. And at this time that has not been considered in the road bill that we are presently working on in Congress.

Mr. CARMICHAEL. I would assume not.

Mr. SCHNEPFE. I wouldn't say that, for in making this analysis it appears to me that many, if not a very large part, of the roads that would be included in a regular program for normal traffic are at the same time needed for civil-defense purposes, and it rather resolves itself into a question of order of priority of construction. Could some of them be advanced on the list of roads that are normally needed in the regular program—could some of them be advanced more rapidly—so the use of these roads for civil-defense purposes might be obtained sooner?

Mr. LIPSCOMB. When will this report be finished?

Mr. SCHNEPFE. We hope to have the preliminary report, which we will issue first, ready in a few weeks. Then it will be followed before the end of the fiscal year with the complete, final report.

Mr. LIPSCOMB. I think this ties in with great importance to the Highway Act that we are now passing because this is the time to get adequate funds for the development of civilian-defense highways if we are putting any emphasis on this at all. I thought it had been covered by this time.

Mr. BALWAN. This information from this study is merely advisory to the FCDA, and then something has to be done about this by the Federal Civil Defense Administrator in the form of recommendations; is that right?

Mr. SCHNEPFE. That's right. And they will submit the recommendations to the Congress. Public Roads will submit the report to FCDA.

Mr. LIPSCOMB. We will not pass a highway bill every year. This is the time to tackle it.

Mr. CURTISS. The highway bill that has been referred to will fit in with any civil defense program that may be developed.

It might be necessary to provide some amendments to the bill if it developed that highways that were needed in civil defense were not covered. Of course while there is a limit to the mileage under the present law on the primary highway system, there is no limit on the mileage that can be added to the secondary system. And we have in this bill four classes of funds.

One of them is for the primary system which is the backbone of the system for the country. There is provision for the secondary system, and for urban improvements on that system in urban areas. Urban areas are defined in the act as places of over 5,000 population.

Mr. HOLIFIELD. There is latitude in these plans, as I understand for them to make adjustments within the areas.

Mr. CURTISS. Yes, there is.

Mr. HOLIFIELD. In other words the passage of the bill at this time and setting up the formula for obtaining the financing for the matter through additional taxes and so forth, can well be supplemented later by recommendations which revert to earmarking of specific funds for specific highways?

Mr. CURTISS. That's right. And the fourth item that I had not mentioned previously was the Interstate System which is the big program and the improvements involved in that system will aid tremendously in evacuating cities.

Out of $27 billion estimate, between $15 and $16 billion is involved in the urban area improvements.

Mr. HOLIFIELD. We have had the bells ring and it is obvious we are not going to be able to finish with your testimony at this time.

(Discussion off the record.)

Mr. HOLIFIELD. We will adjourn until 2 o'clock.

(Whereupon at 12:20 p. m. a recess was taken until 2 p. m. of the same day.)

AFTERNOON SESSION

Mr. HOLIFIELD. Mr. Curtiss, I think at the time we adjourned we were discussing the relation of this master road program to civilian defense, and did you have something you wanted to say further on that?

FURTHER STATEMENT OF C. D. CURTISS, COMMISSIONER, BUREAU OF PUBLIC ROADS; ACCOMPANIED BY FRED E. SCHNEPFE, ASSISTANT TO THE COMMISSIONER, BUREAU OF PUBLIC ROADS; AND P. A. CARMICHAEL, CHIEF, CIVIL DEFENSE PROGRAM, ASSISTANCE BRANCH, BUREAU OF PUBLIC ROADS

Mr. CURTISS. Yes, I would like to add to the statement I made this morning that in effect, the program that is contemplated under this new highway legislation will be one of the greatest contributions, I think, that could be made to the evacuation phase of civil defense.

It may not be the complete answer. There may be needs outside the work that is contemplated within the framework of that legislation. But following the completion of the survival planning study by the Civil Defense Administration, it may well develop that some supplementary authority is needed to improve and eliminate bottlenecks in urban areas which would impede evacuation.

It may well develop that some new legislation is needed to take care of those situations. But it could be done, if Congress so decided, within the framework of the present legislation—with some modifications.

Mr. HOLIFIELD. It would be correct to say, however, that the road program as now presented to the Public Works Committee was prepared without specific consideration of the civilian defense problem, and without specific representation to your department by the Federal Civil Defense Administration?

Mr. CURTISS. I think that is a fair statement, Mr. Chairman, although it was recognized that the work contemplated in that bill would contribute to civil defense.

Now, I may say that the major program in the bill provides for the completion within a limited period of years of the Interstate System. That system consists of 40,000 miles of the principal highways of the country. Last September we completed the final designation of the remaining 2,300 miles that were reserved when the intercity routes were designated in 1947; and before those were approved, they were reviewed, those additions were reviewed, both by the Defense Establishment, and for their application to civil defense.

So in that respect, this legislation will very definitely cover much by way of civil defense requirements as related to evacuation of cities.

Mr. HOLIFIELD. And, of course, your statement is made without any regard to the value of evacuation under modern conditions, or the strategic justification for evacuation, as compared to a shelter program?

Mr. CURTISS. Yes, sir.

Mr. HOLIFIELD. You have made no evaluation of that, whatever?

Mr. CURTISS. We have made no evaluation of that, whatever.

Mr. HOLIFIELD. But if evacuation is made the system, it is obvious that a road system would contribute to it.

Mr. CURTISS. Yes, sir.

Mr. HOLIFIELD. Are there any questions on that?

If not, I wonder if we might take these delegations of authority as you have them outlined here on page 1 of your statement, and take them one at a time, and explore them just briefly.

Under the authority of the delegation No. 1 up there, it reads as follows:

> Provide advice and guidance to State highway departments in the designation of State civil defense emergency highway routes.

As I understand it, the Bureau of Public Roads is ready and willing to assist in this matter any time they are called upon.

Mr. CURTISS. That is correct, Mr. Chairman. I would like Mr. Schnepfe, who has been in charge of this program, general charge for the Bureau, to explain just what we have done.

Mr. HOLIFIELD. I was going to ask that as the next question, after you gave affirmation to the fact that you are ready and willing to cooperate. Now, I was going to ask you, specifically what have you done in that field?

Mr. SCHNEPFE. In that field, prior to the issuance of the first delegation, an agreement was entered into between FCDA and Public Roads to carry on that operation. It was some time before the delegations were issued.

Mr. BALWAN. What date was that?

Mr. SCHNEPFE. April 14, 1954.

Mr. BALWAN. That is the time of the agreement?

Mr. SCHNEPFE. Yes, sir.

Mr. ROBACK. Is that your memorandum of understanding?

Mr. SCHNEPFE. Yes, sir; memorandum of understanding.

Mr. ROBACK. Why was there a memorandum of understanding?

Was there a question of a difference of opinion as to what the agency was being called upon to do?

Mr. SCHNEPFE. No. It was issued in order that there would be a clear basis for action, and it was distributed both to FCDA and to Public Roads representatives.

Mr. ROBACK. By whom?

Mr. SCHNEPFE. It was issued by FCDA, together with an advisory bulletin, as they call it, and the Commissioner of Public Roads issued a copy of that memorandum of understanding, and a copy of the advisory bulletin, to our people, so that everyone might understand the basis for this cooperative effort.

Mr. ROBACK. Was there ever any difference of opinon between FCDA and the Bureau with respect to the FCDA's interpretation of the Civil Defense Act, regarding responsibility in this field, that is, where roads were concerned?

Mr. SCHNEPFE. None that I know about.

Mr. HOLIFIELD. All right.

Now, will you proceed and tell us what has actually been done under that delegation of authority?

Mr. SCHNEPFE. Under that delegation of authority, work has been done largely at the field level. Much of it under item 1 was merely a matter of advice and guidance to the State highway departments on the part of the Bureau of Public Roads, if, as and when called upon. It was an advisory service.

Mr. HOLIFIELD. And have they called upon you extensively for advice, or have they failed to resort to this—

Mr. SCHNEPFE. So far as I know, they haven't called on us a great deal. I don't think it is necessary. I think they were able to work it out between the FCDA regional directors and their State directors and the State highway departments.

Mr. HOLIFIELD. So, for all practical effect, there has been nothing done under No. 1.

Mr. SCHNEPFE. No, sir, I wouldn't say that. There has been, I am sure, advice and guidance given on the part of Public Roads engineers when called upon.

Mr. HOLIFIELD. Yes, but you tell me that, so far as you know, you have not been called upon.

Mr. SCHNEPFE. I don't know to what extent we have been called upon.

Mr. HOLIFIELD. I see.

Mr. BALWAN. Are there any guidelines that you give your people which tell them what to pass on to the State people?

Mr. SCHNEPFE. No, there were no guidelines.

Mr. BALWAN. What would be the nature of this advice and guidance? Is it all right to pursue this questioning?

Mr. HOLIFIELD. Yes, I think so.

Mr. SCHNEPFE. Well, I can give you an example of——

Mr. HOLIFIELD. Very frankly, we are exploring this just to find out exactly how much has been done under this delegation of authority. We are not critical of you gentlemen.

Mr. SCHNEPFE. We understand.

Mr. HOLIFIELD. But we want, for the record, an accounting as to what has actually been done.

Mr. SCHNEPPE. Yes, sir.

FCDA conceived the idea that they needed our help along these lines, and to tell you what touched it off, one of the State civil-defense directors issued instructions that in the event of enemy attack, the traffic was to move in a one-way direction to the State line.

His neighbor in an adjoining State issued similar instructions, for one-way traffic to go to the State line on the same route.

Well, that required some coordination, and they thought we might be helpful in such instances.

Mr. BALWAN. They both headed for each other, you mean?

Mr. SCHNEPPE. Yes, they would have met at the State line.

Mr. HOLIFIELD. And there were no facilities to take care of either group?

Mr. SCHNEPPE. No. It was just lack of coordination, a thing that a telephone call might have settled, but FCDA thought we could be of help through our organization throughout the States, and our close cooperation with the State highway departments.

Mr. ROBACK. But you didn't need any specific grant of authority to perform the function of giving advice?

Mr. SCHNEPPE. No, sir.

Mr. ROBACK. You would have given that advice in any event, if called upon?

Mr. SCHNEPPE. Yes, sir.

Mr. CURTISS. Yes. We have a district office in each State which is in almost daily contact with the State highway departments.

Mr. SCHNEPPE. FCDA was able to—wanted to formalize that, so we went along with them, so we would have a clear understanding how to operate, and it was no doubt helpful as a guide to public roads engineers and the civil defense people in the field, as to how they might proceed.

Mr. HOLIFIELD. But that agreement did not necessarily put you in position of authority over the highway departments of two States.

Mr. SCHNEPPE. Not in the least.

Mr. HOLIFIELD. It would only be a consulting part of it.

Let us go to No. 2, where you are supposed to—

Coordinate interstate and State designated civil defense highway systems to assure uniformity of designation for civil-defense emergency purposes.

Is that very much along the same line as No. 1?

Mr. SCHNEPPE. Very much along the same line, but it goes a bit further.

In one division, we were called on to assist, and we came up with a map, which all agreed to, showing such designated routes.

But this has been advisory; and I suppose it has been helpful from the standpoint of our engineers and State highway departments working together in assisting FCDA with this problem.

Mr. HOLIFIELD. You are not the one who initiates action or plans——

Mr. SCHNEPPE. No, sir.

Mr. HOLIFIELD. [Continuing]—or plans any of these movements of population?

Mr. SCHNEPPE. No, sir.

Mr. HOLIFIELD. You only function when called in, whether it is on the district representative basis or one of your nine division areas;

you only function when, as and if called upon, and in an advisory capacity.

Mr. SCHNEPFE. That is correct, sir.

Mr. HOLIFIELD. Now, under authority No. 3——

Mr. MORGAN. Mr. Chairman, could I ask a question over there under No. 2?

Mr. HOLIFIELD. Yes.

Mr. MORGAN. Does No. 2 also include the designation, by signs, of these evacuation routes?

Mr. SCHNEPFE. Well, it would be assumed that signs would be used.

Mr. MORGAN. I mean, does this include the cordination to make sure that, for instance, all the cities in the State and all the cities in an area use the same sort of signs?

Mr. SCHNEPFE. It could very well extend to that if called upon. But then, again, we would not offer any suggestion unless called upon.

Mr. MORGAN. That is decided by FCDA?

Mr. SCHNEPFE. Yes, sir.

Mr. MORGAN. That goes down to their regional and district and State directors?

Mr. SCHNEPFE. That is correct.

Mr. ROBACK. What does the element of coordination go to? Was it coordination in the sense that you worked up a program to designate which were evacuation routes, and that was accepted?

Mr. SCHNEPFE. No. It largely had to do with one State selecting a route, carrying it to the State line, and not being met by the same route on the other side. So we were helpful in getting continuous routes from one State into another.

Mr. ROBACK. Has that coordination been formalized, in the sense of acceptance by either FCDA or State agencies, or is that merely a recommendation which you have just turned over to the FCDA?

Mr. SCHNEPFE. We have a letter here from division 1 which indicates acceptance.

Mr. ROBACK. In all the States which are involved in that, they have signified some kind of agreement?

Mr. SCHNEPFE. No. It was accepted on the part of civil-defense authorities. You see, it is an FCDA matter. Those long highways, those highways extending from one State to another, they are of interest to them largely from the standpoint of mobile support and mutual aid, where they need to get aid from a city some miles away or where it is necessary to evacuate people long distances away in order to get out from a complex of target areas.

This has not presented any problem at all, and I think in some instances Public Roads has been helpful.

Mr. MORGAN. Mr. Chairman, I think that the Commissioner and his assistants have a sign with them which they have brought along, and I would like for them to explain the significance of the sign to the subcommittee.

Mr. HOLIFIELD. Would you please do that?

Mr. SCHNEPFE. As you probably know, some of the States erected signs for evacuation purposes or, rather, they originally erected signs setting aside certain highways for civil defense use, we will put it that way.

That was done in the early days of this work when we thought in terms of a small bomb, starting with the 1X, and that the enemy might

have a very limited supply of them, and that they would be very carefully expended on the most lucrative part of target area and, therefore, it was expected there would be damage in that part of the city the enemy would like most to destroy if successful in hitting his target. And we anticipated there would be fires, we anticipated there would be need for getting medical rescue, police, fire, and all the other services, in there.

So, for that reason, certain routes were selected which would be considered most adaptable for the purpose. For instance, a street that was fairly wide, without high buildings, so that following enemy attack the street would not be cluttered up with debris, and the idea was to hold those streets available for that sort of a purpose, and also for moving people out. And in that connection, they erected those signs, which virtually prohibited the use of those streets for evacuation purposes.

Now the concept has changed. In the event of warning of enemy attack, we now think in terms of utilizing every street or road running out of the city which will go far enough to carry evacuees beyond the danger of being killed by blast. That is the first consideration.

Now these streets are supposed to be used to carry one-way traffic, out of the city, and, therefore, the present signs are no longer suitable.

FCDA fully realizes this, and called on us to recommend what should be done.

So we went to work on the development of civil defense route signs. We tried to get signs that would be distinctive and would not conflict with the regular uniform signing of highways, and you will notice that we have a sign with blue background, with the Civil Defense insignia on it. It is reflectorized. It can readily be seen at night, and it very clearly indicates that one is on the route, or how to reach the route, and when to make a right turn or left turn.

The idea is to erect these signs on evacuation routes which would drain the population from certain designated areas. In other words certain areas of population would be called upon to use certain routes. These would be clearly defined, and the people living in those areas so advised.

The erection of signs, together with specifically prepared maps distributed to the people in advance, would indicate to them the direction they should travel after getting warning of the approach of the enemy.

Mr. HOLIFIELD. Is it your thought this would be a permanent sign, or this would be put up for each emergency as it occurs?

Mr. SCHNEPFE. No, sir, a permanent sign. And a large part of the value would be that it would be educational to the people. They would learn, by seeing the signs, what their route would be.

Mr. HOLIFIELD. Yes, but in view of the testimony we had here this morning, that the fallout pattern might be in variable directions, is it not going to be necessary for you to revise this, or else you might be guiding them right into the path of the fallout?

Mr. SCHNEPFE. Well, my own thinking—and I am not speaking for anyone else on this—is that the most important action to take on receiving warning of the approach of the enemy, with an extremely short warning period, is for the people to get out of town on the routes which have been predesignated for them. It is of first importance to

get away from blast; and if it means that some people would find fallout areas, then from there on the best steps would have to be taken to get them out of that area.

In the first place, the advice as to where that area will be isn't firm enough to cause one in advance to say, "I do not want to go easterly, because that is where the fallout area will be," because it might be in some other direction, because of a shift of the winds. The first thing to do is to get away from the blast if possible, for there is so little time.

Mr. HOLIFIELD. Well, of course, to me, sir, and of course we are all of us entitled to our individual opinions, it occurs to me that setting up permanent evacuation signs, in view of the modern development of radioactivity, would be very misleading in time of emergency.

Certainly, if our weather reporting and our setting of probable routes of evacuation mean anything at all, we cannot utilize all of the egress roads from the city. No. 1, you are going to be pressed for time, and you are not going to have time to send them out of the cities into the path of fallout, and then reorient them in another direction.

No. 2, you do not know where the point zero is going to be, and therefore you cannot firmly say that point zero will be over the center of a city. It might be 5 miles north, it might be 5 miles south.

So it appears to me that while this was probably all right, and I am not saying it is not all right now, on the basis of an emergency erection of the route signs, it would seem very dangerous to put them on all roads leading out of the city and have all people in the area trained to take a certain route which might take them right into the path of fallout.

Mr. SCHNEPFE. Mr. Chairman, I can understand your feeling and thinking in the matter. This is a serious problem. It would seem to me that present thinking is that those people who would start out on a route which would lead them right into the fallout area might be diverted to areas which would not be contaminated, when it is learned where the fallout area is. That does not mean they follow a designated route if information indicates that the route leads into a contaminated area.

As soon as there is firm information, which probably will have to be obtained by monitoring, that a route leads into a fallout area, then steps would be taken in traffic control to divert them, left or right, from that route.

Mr. HOLIFIELD. I guess we cannot solve that problem today. Any questions?

Let us go to No. 3, then. Now, your delegation is to—

Plan a national program, develop technical guidance for States, and direct Federal activities concerning emergency clearance and restoration of highways, streets, and bridges in damaged areas.

Now, I understand you are preparing a manual on that.

Mr. SCHNEPFE. Yes, sir.

Mr. HOLIFIELD. For distribution, but that has not been prepared as yet.

Mr. SCHNEPFE. It has not been completed. We are having it done by one of our engineers, who is working part-time on it. We are not in position——

Mr. HOLIFIELD. One engineer is doing this?

Mr. SCHNEPFE. Yes, sir; part-time.

Mr. HOLIFIELD. When do you plan to have the first draft of it ready?

Mr. SCHNEPFE. It is very hard to say. We checked the other day, and learned the first draft is a little more than half ready, and this engineer sometimes works weekends on it, as well.

Mr. HOLIFIELD. This is a national program, and it is to develop technical guidance for States and direct Federal activities concerning emergency clearance and restoration of highways, streets, and bridges in damaged areas; and you tell me you have one man working on it part-time.

Mr. SCHNEPFE. Yes, sir.

Mr. HOLIFIELD. Do you know whether he is consulting with the FCDA, with regional civil defense directors, target area directors, or anyone like that, or is this just a general manual for pulling limbs out of the highway and repairing, temporarily repairing bridges, or just what is this?

Mr. SCHNEPFE. Well, he has authority to consult such sources of information that may be necessary.

Mr. HOLIFIELD. As far as you know, he has not consulted them yet?

Mr. SCHNEPFE. I don't know that he has consulted them, but I certainly think he has.

Mr. Chairman, several years ago Public Roads was called upon to prepare a manual on that subject. We call it clearance and restortion of streets and highways in civil defense emergencies.

After is was written, and it was written in the Bureau of Public Roads, it was quite a while before it was actually printed. I understand that 20,000 copies were printed and distributed wherever it was thought they would do any good; but under present concepts it is out of date.

That manual was written on the basis of a small area being bombed. Now, with present weapons, it is out of date, so the one we are writing is to take its place.

Mr. HOLIFIELD. Do you think it will be up to date?

Mr. SCHNEPFE. Probably the minute we say, "O. K., let's have it printed. But by the time it is printed it may, at least in part, be out of date. But we want to particularly try to set up some principles of planning and organization, as to how the problem might be met, rather than saying in detailed language, "In light of present weapons, you do just this and that." This approval may assure a longer useful life for the manual.

Mr. HOLIFIELD. Mr. Morgan?

Mr. MORGAN. Under this delegation of authority, you have the responsibility, do you not, to direct Federal activities concerning emergency clearance and restoration of highways, streets, and bridges, in damaged areas?

Mr. SCHNEPFE. The Commissioner has that authority, sir.

Mr. MORGAN. That authority, as well as that responsibility.

Mr. SCHNEPFE. Yes, sir. It is a very definite responsibility.

Mr. MORGAN. During the New England floods of last fall, it was noted that it was necessary for FCDA to delegate this authority to the Corps of Engineers. Can you tell us why this was done? Was it because the Bureau of Public Roads was not able to take on this responsibility, as had been directed a year previous to that, or just what was the reason?

Mr. CURTISS. I don't think this delegation applied to the type of emergency involved in those floods.

Now, we did—we were called on by Civil Defense and our engineers were detailed from several of our different offices, detailed to Civil Defense. In fact, we put in 1,120 man-days in the New England area for Civil Defense on other than our own flood relief highway program, which comes into play after the floods have subsided and we can determine the permanent structures and roads that are needed to repair the damage.

Mr. MORGAN. But the Corps of Engineers did the bulk of the supervisory and contractual work in this instance, did they not?

Mr. CURTISS. That is right. They were called upon by Civil Defense to do that.

However, in the floods in California, in the Northwest, Civil Defense requested our aid in that, and that happened just before Christmas, and we organized 38 different engineer teams, each team in charge of a Bureau of Public Roads engineer, and accompanied by a State highway department man or a county man, whenever they were available, to survey the damage and make immediate plans for restoration.

And, as we did in the West, in addition to the other assistance which we rendered Civil Defense, we did some of the restoration work on highways. That was handled by the Corps of Engineers in New England.

Our work out there, the immediate repair work, involved over 2,000 man-days of engineering time, supervision; and the other work that we did for the Civil Defense was 445 man-days, or a total of 2,460 man-days of effort went into that emergency.

Mr. MORGAN. Mr. Chairman, I think this is what the FCDA had in mind when they delegated this authority to the Bureau of Public Roads or to the Department of Commerce, which was then delegated to the Bureau of Public Roads; but I noted in this New England flood they did have to call in the Corps of Engineers, and the Corps of Engineers testified before us last week they had no civil defense responsibility other than the ones under Public Law 99, I believe they mentioned, which is strictly flood control and harbor restoration.

Yet, without a civil defense responsibility, they were called on in this flood to do what had been delegated to the Bureau of Public Roads, and I was wondering if the Bureau of Public Roads was handicapped by lack of funds or lack of personnel to do the job in assistance.

Mr. CURTISS. Mr. Chairman, it has never been my understanding that this delegation covered emergencies caused by flood or hurricane. It was for a military emergency.

Mr. MORGAN. This was declared a disaster area, and we would like to get it straightened out, if it is your interpretation that you do not have the responsibility to direct this Federal activity in emergency clearance and restoration except under certain circumstances; and if it is your understanding, we would like to have it clarified as to just what these circumstances might be.

Mr. CURTISS. We could only do it when called on by Civil Defense. We have no funds at our disposal without them being made available by Civil Defense in an emergency such as occurred in New England or California.

Mr. MORGAN. This is more a planning direction, then, rather than an operational direction?

Mr. CURTISS. I would say this delegation did not apply to the situation, either in New England or in California. It would be determined——

Mr. HOLIFIELD. In other words, your understanding is that the delegation applied to a wartime function.

Mr. CURTISS. Yes, sir.

Mr. HOLIFIELD. An invasion-of-the-enemy function——

Mr. CURTISS. That is right.

Mr. HOLIFIELD (continuing). Rather than a peacetime emergency?

Mr. CURTISS. Yes, sir.

Mr. HOLIFIELD. And that, therefore, any work you were called upon to do, why, it was strictly in the nature of one agency of Government cooperating with the other, but not necessarily in line of your delegated responsibility.

Mr. CURTISS. We do not consider that we would have authority to step in without request from Civil Defense, other than the work that the Congress has given us on flood relief and repair and restoration of damaged highways. But that program comes later. It is not of an emergency character.

Mr. HOLIFIELD. All right. Let us go to No. 4:

Provide technical guidance to States concerning highway traffic control problems which may be created during a civil defense emergency.

Now, before we go to No. 4, do you have any further comment you wish to make on No. 3?

Mr. CURTISS. Well, Mr. McClure was just confirming that these two things are handled under different laws, and he felt that this delegation applied in case of emergency caused by enemy action.

Mr. HOLIFIELD. Well, that is what we are trying to find out—where your line of responsibility and function is.

Mr. CURTISS. I think I covered that.

Mr. Schnepfe suggests that I mention that following enemy action, this delegation would be operative, and the responsibility would rest in Public Roads; but only in the event of enemy action, and not with a natural disaster——

Mr. HOLIFIELD. As I understand, you are to plan a national program. Now, have you planned that national program?

Mr. SCHNEPFE. The first step we have taken is the preparation of the manual. That is the first step.

Mr. HOLIFIELD. To replace the obsolete manual.

Mr. SCHNEPFE. Yes, sir. And then from there, to carry out the educational campaign with State highway departments, and with everybody who might need to know anything about it.

But the question was asked with respect to operational functions, as I understand it, with respect to point 3, in the event of enemy attack. For example, if an essential bridge is destroyed. Then it becomes the responsibility of the Commissioner of Public Roads to see that traffic is restored; and in that he has the authority and the responsibility of the Administrator of FCDA, it is delegated to the Commissioner.

If there is a breakdown on a local and State basis for doing the things necessary to replace the bridge we will say, an essential bridge,

then it becomes the responsibility of the Commissioner to see that that bridge is replaced or repaired.

Mr. HOLIFIELD. But you do not have the organization and the facilities and equipment to do that work, actually, do you?

Mr. CURTISS. No, sir.

Mr. HOLIFIELD. Nationally.

Mr. CURTISS. Only in a very few limited areas. We have already delegated to our division engineer who has headquarters in Arlington, immediately upon enemy attack he is authorized to do whatever he can with the forces he has or he can commandeer, to restore traffic in this area.

Mr. HOLIFIELD. Undoubtedly, it was the lack of equipment and facilities for an emergency of the magnitude of the New England area which caused the FCDA to pull in the Army Engineers, the Corps of Engineers.

Mr. CURTISS. I presume that is correct.

Mr. HOLIFIELD. They have a larger operating organization, and a larger supply of road-fixing equipment and bridge-building equipment, and so forth.

Mr. CURTISS. That is right.

In the West, of course, we have a large forest highway program, and we have engineers and superintendents who are experienced in road repair and maintenance, and so forth; while we work largely through the State highway departments here in the East. We don't have direct construction as we have in the Western States.

Mr. HOLIFIELD. You contract mostly with local political bodies in the building of roads in their districts?

Mr. CURTISS. Well, the Federal aid program is handled entirely by the State highway departments.

Mr. HOLIFIELD. State highways.

Mr. CURTISS. In the national forests and national parks, we do the road work under authorizations from the Congress.

Mr. HOLIFIELD. You have your own equipment there?

Mr. CURTISS. Yes. Well, that is largely let to contractors, but we do have equipment we can throw in.

But out in California, we pulled in everyone that was qualified in any way to do this emergency repair work and get the traffic rolling again—contractors, State equipment, anything that could be made available.

Mr. HOLIFIELD. Were you authorized to obtain private contractors to do these jobs, and with the authority to pay them, and so forth?

Mr. CURTIS. Yes, sir, by Civil Defense.

Mr. MORGAN. Mr. Chairman, I has this one question.

Mr. HOLIFIELD. Yes.

Mr. MORGAN. In the Corps of Engineers' report on appropriations covering the flood last year, they indicated:

> The Bureau of Public Roads of the Department of Commerce is responsible for extending aid and for the repair of highways and bridges on primary and secondary Federal highway systems, the national system, on interstate highways and on the urban systems. Accordingly, no emergency repairs or temporary restoration of such facilities will be understaken by the Corps of Engineers unless the local representative of the Bureau of Public Roads certifies no funds are available to that agency for accomplishing that emergeny work.

Is this the case as it happened in the flood area? Did your local representative indicate that you had no funds available for this particular phase of the work?

Mr. CURTISS. I don't know just how that was handled, but it is true that we have no emergency funds available to us directly.

In the west coast situation, those funds were made available by Civil Defense.

Mr. MORGAN. In other words, Civil Defense has given you this delegation of authority without providing you adequate funds to carry it out.

Mr. CURTISS. Well, any funds that we have would be available in the event of enemy action, but not in the case of a flood.

Mr. ROBACK. What is the basis for the authority by which you are called upon to assist in the flood or other disaster operations?

Mr. CURTISS. Well, I think there is general authority for any Government agency to work with any other Government agency on a reimbursable basis. This work that we did for them in New England was on a reimbursable basis.

Mr. ROBACK. Well, that would be true even under a delegation of authority for civil-defense planning?

Mr. CURTISS. Yes, that is right.

Mr. ROBACK. Because there is no distinction in the sense that it is on a reimbursable basis.

Mr. Chairman, I would like to request that the Bureau, through the help, perhaps, of its General Counsel, supply to us a legal memorandum stating their understanding that the delegated authority by Civil Defense does not cover disaster operations.

Mr. SCHNEPFE. Natural disaster

Mr. CURTISS. Yes, sir.

Mr. HOLIFIELD. Natural disaster.

Will you have your counsel supply that?

Mr. CURTISS. Yes, sir.

(The information referred to is as follows:)

DEPARTMENT OF COMMERCE,
BUREAU OF PUBLIC ROADS,
Washington 25, March 22, 1956.

HON. CHET HOLIFIELD,
Chairman of the Military Operations Subcommittee,
Room 1611, House Office Building.
Washington 25, D. C.

DEAR MR. HOLIFIELD: Pursuant to the committee's request during my testimony on Tuesday, March 13, 1956, I have received from my Solicitor a legal memorandum showing why the delegated authority by FCDA to which I referred in my statement did not cover natural disaster operations.

My Solicitor states that the Federal Civil Defense Act of 1950 (64 Stat. 1248), as amended, deals with protection of life and property from attack by an enemy. Under that statute, responsibilities are placed in the hands of the Administrator of FCDA with a right of delegation granted by section 201 (b). By FCDA delegations No. 2 of September 8, 1954, and No. 3 of August 13, 1955, the Secretary of Commerce was delegated certain responsibilities and authorities. By Department orders of February 1, 1955, and September 30, 1955, redelegations were made by the Secretary to the Bureau of Public Roads.

The specific five items of authority and responsibility were set forth by me in my opening statement to the committee and need not be repeated here. In addition, I also set forth the pertinent provision of a memorandum of understanding between FCDA and the Bureau detailing some of the particulars of the work to be carried on under the delegation.

My Solicitor advises me that the delegations of authority referred to above which were granted under the Federal Civil Defense Act of 1950, as amended, could not delegate any authority concerning natural disasters because that act does not give to the Administrator of FCDA any authority over natural disasters.

Although this answers the specific request put to me by the committee, I feel that a further explanation of our authority in the case of natural disasters would be helpful. By Public Law 875 of the 81st Congress (64 Stat. 1109), as amended, Congress provided certain means of assistance by the Federal Government to the States in the event of major disasters. This law does not become operative until the President has made a determination and the governor of the State involved has certified the need of assistance and has given assurance of an expenditure of a reasonable amount of State or local funds for disaster relief. By Executive Order 10427 of January 16, 1953 (18 F. R. 407), authority was given to the Administrator of FCDA to direct Federal agencies to provide assistance in major disasters and to coordinate activities of Federal agencies. FCDA delegated this responsibility to its regional directors.

The Secretary of Commerce and the Administrator of FCDA entered into a memorandum of understanding concerning responsibilities in disaster operations. FCDA coordination is to consist of determining the total assistance needed and it will make the necessary decisions concerning the amount of Federal financial contribution for which the acting agency will be reimbursed. Thereafter, under date of July 16, 1953, authority was delegated by the Secretary of Commerce to the Commissioner of Public Roads "to utilize the resources at his disposal in providing disaster assistance upon request and authorization of the Federal Civil Defense Administrator."

The Bureau of Public Roads in turn redelegated this authority and responsibility on August 28, 1953, to its division and district engineers. Thus, the Bureau has been and is in a position to act with reference to major disasters whenever the President makes the determination required by Public Law 875 and the FCDA makes the request and provides for reimbursement to the Bureau.

I testified that in the floods in California, FCDA did request our aid and that we did restoration work on highways. The actual way that this operation came into being was by a telephone call from the regional administrator for FCDA in the San Francisco region to our division engineer located in San Francisco requesting the Bureau to provide assistance concerning roads damaged by the floods in the California and Nevada disaster areas. Subsequently, the authority was confirmed by telegram reading as follows:

"DECEMBER 31, 1955.

"RAYMOND ARCHIBALD,
Division Engineer, Bureau of Public Roads,
Old Mint Building, 5th and Mission Streets,
San Francisco, Calif.

"This will confirm verbal instructions issued you December 26. United States Bureau of Public Roads is authorized to immediately undertake any work which in their judgment is considered necessary in the areas affected by the flood disaster in the States of California and Nevada for removal of debris, clearance of roads and emergency repairs and restoration of roads in the States. This work is to be performed as requested by the States and in accordance with Public Law 875 and is to provide assistance to the States and local communities affected by this major disaster by contract and/or utilizing the (1) personnel, (2) equipment, (3) supplies, and (4) facilities of the Bureau of Public Roads. The Bureau of Public Roads will coordinate their work with the FCDA Regional Administrator and report each project as it is undertaken and completed. The FCDA may reimburse the Bureau of Public Roads for funds expended in accordance with the above and the provisions of Public Law 875.

"BATSON FCDR7 DA312058Z."

I trust that this description of the methods by which the two functions, i. e., enemy attack and natural disasters, are handled, will be of assistance to the committee.

I feel that there is no need in this letter to go into detail on the operation of our emergency relief fund as authorized by 23 U. S. C. 13a for the repair of highways on the Federal-aid system damaged by a disaster since FCDA does not take part in the administration of this authority.

Very truly yours,

C. D. CURTISS,
Commissioner of Public Roads.

Mr. HOLIFIELD. Now let us skip to No. 4:

Provide technical guidance to States concerning highway traffic control problems which may be created during a civil-defense emergency.

Have you initiated any plans to do that, to discharge that particular responsibility?

Mr. SCHNEPPE. Soon after Public Roads was advised of the redelegation of certain items in Delegation No. 2, steps were taken to begin on the exploratory part of that job.

A task force of four men was organized and spent a month getting the initial work started.

Studies along those lines, of course, have been carried on right from the very beginning, not only using our own staff of men who have devoted full time to it, but we have called on various ones throughout our organization, some of our top people, for assistance in the various phases of it.

Lack of funds—I hate to mention that again—kept us from going ahead and doing what we should like to have done.

Now, as I see it, one of the first things we should do in preparation for assisting FCDA in carrying out the highway part of their "Survival Planning" work, is to get a group of men indoctrinated so that they are really prepared and trained to assist; and in that connection, the first thing that we would do would be to prepare a manual of procedures.

We now have one in draft form. We have not been able to finish it.

The next step would be the preparation of a training course in advance of bringing in the engineers, to take the course, and that is quite a sizable job in itself.

Next we planned to bring in probably at least 15 engineers from the various divisions, carefully selected for this work, and put them through this course of training; and at the same time have them receive lectures from various ones in FCDA, AEC and others to give them special background information needed for carrying on this special work.

We have not been able to do any of that. And also——

Mr. HOLIFIELD. You are talking about Item No. 5 on page 2 of your——

Mr. SCHNEPPE. Item No. 4, sir.

Mr. HOLIFIELD. Item No. 4 on page 1. But isn't that the same thing as Item No. 5 on page 2? You talk about the FCDA technical manual on "Utilization and Control of Streets and Highways," and the one entitled "Clearance and Restoration of Streets and Highways in Civil Defense Emergencies."

Mr. SCHNEPPE. No, sir. The numbering is a bit confusing. At the bottom of page 1, item 1 is taken from the memorandum of understanding and is an explanation of what is intended in item 4 of Delegation No. 2:

Provide techincal guidance concerning evacuation planning and highway traffic regulation and supervision problems which may be created during a civil defense emergency.

In other words, that is the $64 question—How to evacuate the people?

Mr. LIPSCOMB. Mr. Chairman, could I ask, what is the Bureau of Public Roads' idea of this term "civil defense emergency"? I mean, what do you consider a civil defense emergency?

Mr. CURTISS. Well, I have taken that to mean enemy action.

Mr. LIPSCOMB. Has there been any understanding with your agency, since the Federal Civil Defense Administration does all the natural disaster work, too?

Mr. CURTISS. We have never had any indication that any of this was effective on a natural disaster.

Mr. SCHNEPFE. No, that never has been indicated to us.

Mr. McClure is pointing out that under Public Law 875, the Civil Defense requires assistance, and they have called on us to do certain things that we have not considered are encompassed under these delegations. That is a separate operation.

Mr. LIPSCOMB. Then if there is a natural disaster, you feel, right at the present time, you have no responsibility?

Mr. CURTISS. Well, we anticipate that Civil Defense is going to call on us, and when we learned of the possible hurricane damage, we got in touch with Civil Defense. We had two men in the Washington office on 24-hour duty.

Mr. LIPSCOMB. In this manual which you are revising, "The Utilization and Control of Streets and Highways in Civil Defense Emergencies," you are not giving any thought to the overall duties of Civil Defense? You are just thinking of enemy action or a disaster of that sort, and not considering the natural disaster problems that Civil Defense is also concerned with?

Mr. SCHNEPFE. That is true, under the delegation.

Mr. CURTISS. That is our conception of the delegation.

Mr. HOLIFIELD. As a matter of fact, it has not worked out that way, because you have been called in now in the New England area, to a certain extent.

Mr. CURTISS. That is right.

Mr. HOLIFIELD. And you were also called in in the California area.

Mr. CURTISS. That is right. But that is under a different law.

Mr. HOLIFIELD. It is under a different law. Well——

Mr. CURTISS. I mean, it is not contemplated in these delegations, at least.

Mr. ROBACK. It is not a continuing authority. It is just a one-shot proposition when a disaster occurs.

Mr. CURTISS. That is right. That is, we are not organized for it. We have to stop some of our regular work and take that over.

We called people back from annual leave. They worked Christmas and New Year's and Sundays on that California flood situation.

But we move into a situation like that and get in immediate touch with the State highway department, because of our own program. We want to be in constant touch so that we can evaluate the permanent damage which has been done. And we did that along with our other work for Civil Defense.

Mr. ROBACK. Do you have occasion, Mr. Curtiss, to do—were you finished, Mr. Lipscomb? Excuse me. I did not mean to interrupt you.

Mr. LIPSCOMB. Yes, go right ahead.

Mr. ROBACK. Do you have any occasion to do work with the Interstate Commerce Commission in this connection?

Mr. CURTISS. No, I don't think of anything.
Do you?

Mr. SCHNEPFE. No, except that in some way or another, the Interstate Commerce Commission has something to do in connection with a delegation from ODM with regard to planning emergency transportation, and in that connection there is a working group of ODM which is chaired by Mr. Silver, of ICC, and we have membership on that working group.

Mr. ROBACK. Your traffic control problem leaves out the question of any kind of rail traffic?

Mr. SCHNEPFE. Definitely, yes.

Mr. ROBACK. Do you know who is responsible for coordinating rail traffic control with highway traffic control in civil-defense matters?

Mr. CURTISS. I do not. Do you?

Mr. SCHNEPFE. I do not.

Mr. HOLIFIELD. Getting to the fifth point of your delegation or redelegation of authority under section 3:

> Determine and evaluate, with the cooperation of the States, counties, and cities, and assist in the planning of the needs for highway improvements to meet civil-defense requirements.

Now, what have you actually done on that at that point?

Mr. CURTISS. Mr. Schnepfe will answer that.

Mr. SCHNEPFE. The first thing we did was to make a study to determine how such a report might be made, first of all from the standpoint of the material which needed to be collected, how we should collect it, its analysis, and so forth.

So in that connection, through our Research Division, several men were assigned to the task of preparing a manual of procedure, and here is the manual.

Mr. Morgan has a copy. This was used as a basis for collecting the material.

Immediately upon completion of this manual, we carefully selected engineers from the field, from all of the divisions, 21 in number, and arranged for them to come to Washington, in order that they might learn just how to proceed with this work.

We had a 4-day conference, and everything set forth in the manual was fully explained.

Then these engineers went back to the field, and working with the State highway departments, they laid the groundwork for the State highway departments to collect the necessary information.

The State highway departments cooperated wholeheartedly. In the larger States where there are quite a few miles of roads and much traffics, in some cases the highway commissioner appointed a team, a team of top men, to go to work on it, and then they called in from the field whoever else they needed, and that formed the organization for the collection of the information.

It was not just a case of sending out a questionnaire. Our men went out into the field and worked with the State highway engineers in preparing this information.

Mr. Carmichael has been responsible for the analysis of this material, leading up to and including the preparation of the draft of the report, and, if I may, I would like to ask Mr. Carmichael to tell you about that phase of the work.

Mr. HOLIFIELD. All right, Mr. Carmichael.

Mr. CARMICHAEL. I just wonder, Mr. Chairman and members of the committee, how much of the detailed techniques involved in this thing you would like to know.

Mr. HOLIFIELD. I don't think we want to go into great detail. I think what we want you to tell us is what you have accomplished to date, how much it has cost you, what you asked for originally to do this job, and how much has been allocated to you by FCDA to do the job.

Mr. CARMICHAEL. Well——

Mr. HOLIFIELD. If there has been any delay in getting your planning.

Mr. CARMICHAEL. In the matter of costs, we have a total allocation of $120,000 made to us, but that, I understand is——

Mr. CURTISS. Mr. Chairman, I think I probably should answer the first part of your question.

Our original estimate was $500,000. That went to the Budget Bureau in that amount; and in the hearings of the Budget Bureau, that was reduced to $250,000, and I think it came to the Congress in that amount. I do not know that it showed up separately for the Bureau of Public Roads, but it was in the total requested by Civil Defense.

The initial allotment to us after the appropriation was made, which I understand was considerably less than requested by Civil Defense, we were allotted $70,000; and later we were allotted an additional $50,000.

We are utilizing that allotment to us, $120,000, to do the work on this delegation No. 3.

Much of the work under the other delegations falls within some of our regular activities, enough, at least, so we felt, at least before the appropriation of funds was made for this work, that we could cooperate with them without being reimbursed. But we are utilizing the funds which were transferred to us in the amount of $120,000, to carry on the work that we are doing now, and it is not enough to do a complete job under all those delegations.

Mr. MORGAN. Commissioner Curtiss, is it true that this $50,000 came from the apropriation for the survival planning, or are you aware of that?

Mr. CURTISS. I don't know. We advised the Civil Defense that the $70,000 allotment would not permit us to complete the work outlined under delegation 3 which we thought was necessary, and they transferred an additional $50,000 to us.

Mr. MORGAN. Might I ask the same question of Mr. Schnepfe: Is he aware that this $50,000 came from the survival planning appropriation, or is that not true?

Mr. SCHNEPFE. It is my understanding it came from that appropriation of $10 million for survival planning research, and so forth.

Mr. HOLIFIELD. All right, Mr. Carmichael, will you now please tell us what you have actually accomplished to date?

Mr. CARMICHAEL. Well, we have to date summarized most of the material which was sent in by various State highway departments, with the assistance of our field offices, for the 185 target areas listed by FCDA.

We have also composed a preliminary rough draft of the report on the subject; and in our tabulations, we are showing hourly patterns

of evacuation times to each of the three screen lines with existing highway facilities, and according to various population groups of target areas.

We are showing a series——

Mr. HOLIFIELD. Is that the rate of movement of people out of different target areas?

Mr. CARMICHAEL. It is a summary. It is a summary tabulation for all target areas in certain groups of population centers. That is, we have 5 population groups ranging—the lowest code would be target areas of 100,000 and less, and then from 100,000 to 250,000, 250,000 to 500,000, and so on, and those are shown in summary form.

Mr. HOLIFIELD. And you have made estimates as to how long it would take to evacuate those people?

Mr. CARMICHAEL. The estimates were made by the States in the original compilation.

Mr. HOLIFIELD. By the States?

Mr. CARMICHAEL. Yes, sir,

Mr. HOLIFIELD. Do they vary quite widely as a result of the topography and inlet and outlet roads, bridges, and so forth?

Mr. CARMICHAEL. Quite widely.

Mr. HOLIFIELD. Within the same population area?

Mr. CARMICHAEL. Yes.

We are also showing, or we will show, tabulations of the estimated costs of highway capacity improvements necessary to accomplish evacuation to any given screen line in the number of indicated hours, arranged by number of target areas in each population group and for each hour time and distance of evacuation that required or did not require capacity improvement expenditures to effect such highway evacuation.

We have also shown the amount of the capacity betterment that is achieved by the type of improvements which would normally be made for normal, for ordinary traffic requirements as compared or as opposed to that type of improvements which would be required for evacuation purposes only, and not for normal traffic requirements.

Mr. HOLIFIELD. Do you have, for instance, a study of Washington, D. C.?

Mr. CARMICHAEL. Washington, D. C., was included in the study, yes.

Mr. HOLIFIELD. Do you have an estimate as to how long it would take to evacuate the District?

Mr. CARMICHAEL. Well, our studies comprehend combinations of target areas, so-called target areas, to include consideration of situations of the kind earlier mentioned, where evacuation from 1 single target area, 1 individual target area, would conflict with movements from another target area. And we have included Washington in a complex of target areas which also has in it Annapolis and Baltimore.

And, you see, the screen lines that surround—the 15- and 25-mile screen lines that surround Washington and Annapolis impinge to such an extent that you cannot direct toward Annapolis traffic that is fleeing Washington, or vice versa, but different corridors of escape have to be contrived. And those things are taken into consideration in this study.

However, I think that it should be mentioned that this study, and it probably already has been mentioned, that this study was done rather quickly. As Mr. Schnepfe says, the people who came in here from the field, our own fieldmen, came in here in September, and we had the information in from all of the States in the first week in November; and because there seemed to be a requirement for expeditiousness in the matter, we asked for the early deadline.

The States responded with alacrity and were assisted by our field people. And the result was, by mid-November we had in data for all of the 185 target areas.

The study was aimed, or directed, at a nationwide estimate of the possible good that might be done through highway capacity improvement for evacuation purposes nationwide; and because of that, it is not a substitute, by any manner of means, for an individual survival plan study, which has to be undertaken on the ground in each target area.

And the estimates of this particular study were very often made in an office, from office records, from existing road inventories, for both State and local roads, and would have to be checked; the individual road, each mile of the highway, would have to be inspected for these possible constrictions.

So that it was a fast study, and is not a substitute for an actual on-the-ground survival plan, an evacuation plan.

Mr. HOLIFIELD. Would you say that it has any value?

Mr. CARMICHAEL. Oh, indeed. I believe it definitely gives an indication of what might be expected, what sort of benefits might be expected to accrue from the regular highway program; and also, what additional highway capacity improvements, would be required for fast evacuation, and what wholly new capacty, purely for evacuation purposes would be required.

But in an overall amount, by groups of areas nationwide are these data-summarized, so that you could not take our Washngton-Annapolis-Baltimore data, for instance, and say, "Here we have a good, fast substitute for a complete target area evacuation study. We don't have to go to the individual areas and make a special evacuation plan study. We have it right here." I don't think that is true. But I think it does give us a pretty good notion to what exent highway improvements can be depended upon to help this evacuation problem.

Mr. HOLIFIELD. Well, maybe I am missing the point, but I cannot see where you have got anything tangible out of this study for the Washington - Annapolis - Baltimore area. What actual, tangible knowledge do you have out of it?

Mr. CARMICHAEL. We do have an estimate. We have a figure of what road improvements would mean in lowering evacuation time or in increasing the numbers of persons evacuated in a given length of time. I think we do have a pretty good estimate of this thing.

But, as I say, it is not a refined figure.

Mr. ROBACK. Mr. Chairman, could we get a brief summary of what the overall magnitude of cost is for different evacuation times; I mean of improvement, added capacity.

Mr. CARMICHAEL. Well, we would have to get that from our tabulations. I don't have it in my head.

Mr. ROBACK. Do you have any kind of an order of magnitude figure?

Mr. CARMICHAEL. No, I don't, because we have a figure set up for each one, or have it in our tabulations for each one of the screen lines and for all periods of hours, that is, from an hour and a half, say, to the 15-mile screen line, up to 8 hours to the 40-mile screen line, and those figures all vary, of course.

Mr. MORGAN. Mr. Chairman, I think it would be helpful to the subcommittee if we had a copy of this report when it is available.

Mr. SCHNEPFE. You are on the list for it; you will get one of the first, I assure you of that.

Mr. HOLIFIELD. When do you think this report will be ready? You have had 4 months since the middle of November.

Mr. CARMICHAEL. I think Mr. Schnepfe this morning indicated we would have a review of the preliminary report completed in the next 3 to 4 weeks.

Mr. SCHNEPFE. In the next few weeks; yes. We will not wait until we complete every phase of this report. We will get out a preliminary report first, so as to give the overall picture, just as soon as possible. And then we will follow with the final phases of the report.

Mr. HOLIFIELD. Now, we have earnestly tried to find out what your function is, under this delegation of authority, and what you have accomplished to date.

Do you think this committee would be fair in reaching the conclusion that as far as any tangible contribution to the problem of civil defense is concerned, that your contribution is, as of now, a minor one, and one of minor importance in relation to your other duties and missions? In other words, in manpower, in men assigned to it, and in hours of study given to it, and in tangible plans accomplished, would you say that it would be a minor part of the Bureau of Public Roads' function and responsibility?

Mr. CURTISS. Very definitely, Mr. Chairman. We have a $13 million admiinstrative budget, and we have $120,000 to do this work. Of course, we have drawn on, we have had a great deal of help from, the State highway departments.

This planning and this report which Mr. Carmichael referred to would be quite impossible if the State highway departments and the Bureau, through the years, had not been collecting information through the so-called State-wide highway planning surveys and the studies that have been made in the various urban areas and rural areas, too, on our highway systems.

Mr. HOLIFIELD. You understand, we are not criticizing you. What we are trying to do is to evaluate the degree of progress that has been made in the civilian defense field; and in following through, we are taking up each department of Government where there has been a delegation, to find out what their contribution has been to date, and what order of magnitude their assignment assumes in their own or along with their other duties.

Mr. CURTISS. Well, we have had to more or less shape it to the funds that have been made available.

Mr. HOLIFIELD. So, then, the assumption that I have stated is substantially correct?

Mr. CURTISS. I think so; and I think the importance of the delegation, though, warrants more work being done than we have been able to do on it.

Mr. HOLIFIELD. And more funds being allocated to you, possibly, than have been allocated?

Mr. CURTISS. Well, that is one of the prime essentials.

Mr. HOLIFIELD. I see.

Are there any further questions, Mr. Riehlman? Mr. Lipscomb?

Mr. RIEHLMAN. I have no further questions.

Mr. HOLIFIELD. Mr. Morgan?

Mr. MORGAN. Mr. Chairman, I have only one, and I was just wondering if there are any Bureau of Public Roads representatives as liaison people with the FCDA organization, at either the national or regional level.

Mr. CURTISS. We still have one, detailed to FCDA up in the New England area, in their regional office, and I am quite certain their work is not entirely completed out in the West. We have in that area 3 men assigned full time to FCDA and 2 men assigned part time.

Mr. MORGAN. And this is just because of the flood last year?

Mr. CURTISS. Yes, that is because of a natural disaster.

Mr. MORGAN. But as a usual thing, you do not have a person assigned to any of these civil defense offices, either local, State, or regional, or Federal?

Mr. CURTISS. No, not definitely detailed to them in connection with these delegations, like the Weather Bureau has. We do have our district and division offices in many of the cities where civil defense regional offices are located. We have frequent contacts with them.

But so far as having an engineer detailed permanently to the regional offices of civil defense, we don't have any such arrangement.

Mr. ROBACK. Are your field employees mostly engineers?

Mr. CURTISS. Our total force is about evenly divided between professional and subprofessional engineers, and the clerical and administrative, nontechnical force. We have, I think, as of the first of the year, around something like 3,100.

Mr. ROBACK. Is that the total field——

Mr. CURTISS. Sir?

Mr. ROBACK. Thirty-one hundred in the field?

Mr. CURTISS. No; 3,100 total. There are about 2,327 in the field, and 795 in the Washington area, for a total of 3,122.

Mr. ROBACK. Do you use any force account labor in your road construction?

Mr. CURTISS. Occasionally, but practically all of our work is done by contract. There are occasionally items in which we have difficulty in getting contractors, and then we have to handle those by force account.

That was particularly true in some of our access road work to isolated uranium deposits.

Mr. HOLIFIELD. I want to trace one line of procedure.

In the event of a military disaster, the Bureau of Public Roads would rely first on the State highway departments for emergency clearance and restoration of highways, streets, and bridges?

Mr. CURTISS. Yes, sir.

Mr. HOLIFIELD. And then, providing you were called upon by the FCDA first.

Mr. CURTISS. Well——

Mr. HOLIFIELD. In other words, if FCDA called upon you for help, you would rely first on your State highway departments for help?

Mr. CURTISS. I think that would be our first reliance.

Mr. HOLIFIELD. Then if they were unable to do the job, you would call upon civilian contractors and anyone who was available to do the job?

Mr. CURTISS. That is right.

Mr. HOLIFIELD. Then, as a last emergency, you would call upon the Corps of Engineers?

Mr. CURTISS. We would not.

Mr. HOLIFIELD. You would not?

Mr. CURTISS. We would call on anyone that could help.

Mr. HOLIFIELD. Would you then go to the engineers, the Corps of Engineers, as a last resort, or would you depend upon the FCDA going to them directly and asking them to help you?

Mr. CURTISS. I think there would be some top coordinator to all of this, and I think it would be the Civil Defense, and they would have to work it out in accordance with the situation at that particular place.

I would assume that the Corps of Engineers would probably be pretty well occupied with their military responsibilities, I don't know. But I think in a great emergency, that every possible source of help would have to be utilized.

Mr. HOLIFIELD. Mr. Morgan has one more question.

Mr. MORGAN. Commissioner Curtiss, since the Corps of Engineers has explained to us that they operate in a similar manner, by relying to a great extent on civilian construction contractors for their repair and restoration work, and you have a similar setup, in the case of a disaster, and you both have duties to perform, there would be a tremendous drain on the manpower available, or there would be a tremendous demand on this manpower.

What organization has the responsibility of coordinating this demand for manpower?

Mr. CURTISS. I think that would be either Civil Defense or, the Office of Defense Mobilization.

Mr. MORGAN. Do you have any liaison with the Office of Defense Mobilization?

Mr. CURTISS. Yes, sir.

Mr. MORGAN. By telephone, or do you actually have a man assigned there?

Mr. CURTISS. Well, it is by telephone and by personal contact. And, of course, in the Department, General Holmes heads that work.

Mr. MORGAN. In the Department of Commerce, you mean?

Mr. CURTISS. Yes, sir.

Mr. HOLIFIELD. Thank you very much, gentlemen, for your testimony.

Mr. CURTISS. Thank you, Mr. Chairman.

Mr. HOLIFIELD. I am sorry we had to call you back this afternoon.

Mr. CURTISS. That is quite all right, sir.

Mr. HOLIFIELD. We will expect you to give us those items called called for during the course of our hearings, whenever you have them.

Mr. CURTISS. We will get that just as promptly as we can, and submit it to you.

Mr. HOLIFIELD. All right.

We will stand in recess now until 10 o'clock tomorrow morning.

(Whereupon, at 3:15 p. m., the subcommittee recessed, to reconvene at 10 a.m., Wednesday, March 14, 1956.)

CIVIL DEFENSE FOR NATIONAL SURVIVAL

WEDNESDAY, MARCH 14, 1956

HOUSE OF REPRESENTATIVES,
SUBCOMMITTEE ON MILITARY OPERATIONS,
OF THE COMMITTEE ON GOVERNMENT OPERATIONS,
Washington, D. C.

The subcommittee met at 10:20 a. m., in room 1501, New House Office Building, Hon. Chet Holifield (chairman of the subcommittee) presiding.

Present: Representatives Holifield (chairman), Griffiths, Kilgore, Riehlman, and Lipscomb.

Also present: Michael P. Balwan, staff director; Herbert Roback, director of investigations; William Pincus, associate general counsel and Robert J. McElroy, investigator.

Mr. HOLIFIELD. The subcommittee will be in order. We are deeply grateful this morning to have Otto Nelson, vice president in charge of housing for the New York Life Insurance Co., as our witness. Mr. Nelson has done some notable work on the Project East River and the 1955 Review of the Report of Project East River which was brought to the attention of our committee members and our staff some time ago. We feel that we have an expert on this subject before us this morning.

Mr. Nelson, you have a prepared statement here which I have had the opportunity of reading. I would like for you to present it fully at this time.

STATEMENT OF OTTO L. NELSON, JR., VICE PRESIDENT IN CHARGE OF HOUSING, NEW YORK LIFE INSURANCE CO.

Mr. NELSON. Thank you. I think probably first I should disclaim any role of expert. I found that there aren't very many people that know very much about this field, so I think I am in that class. I have been interested in it though since we started working on Project East River in 1951. Perhaps I should say as one item of my background which I don't wish to conceal but I did not want to mention because I am not speaking for the Defense Department. I am also a retired Army Officer. I was a major general in the Army and served in the Army from 1924 to 1946.

I thought I might go over my prepared statement and interpolate a few things as I go along.

Mr. HOLIFIELD. We will be very happy to have you make any additional testimony that you wish to make.

Mr. NELSON. First of all, it seems to me this committee is doing a very great service to our country. Not enough has been done in trying

to get a good philosophy, a good program of action in this very important field. It is new, difficult and I think you are rendering a real public service and I am very glad to be able to come down and appear if I can be helpful.

I think also that in Project East River both in the original one and in the 1955 review, there is much that is pertinent to this inquiry. And I should like to respectfully invite your attention to those reports. They go into much greater detail than I can this morning.

I did read the prepared statements of both Lloyd Berkner and Richard Emberson when they appeared before you. I certainly would support the general statements which they made to this committee. I thought I would like to present my views under three headings: First, the need to determine the relative importance of nonmilitary defense in terms of our overall defense program in order to establish the scope, size, and proper cost of a nonmilitary defense program; secondly, the kind of an organization that is needed; and third, some of the basic principles that might or ought to be followed.

I thought I should define what I mean by nonmilitary defense. Personally I like this term because it includes all the many facets of the problems that our country faces in an atomic age that are not, in my opinion, properly the province of the military.

I have said that nonmilitary defense relates to those measures primarily involving our civil population and economy. To me it means not only civil defense; it means the whole program of reduction of urban vulnerability; it means the problem of industrial location; it means all the things that primarily affect the civilian population and our economy. Such things as continuity of government, continuity of industrial production, not only in government on the Federal level but also on the State and local level.

It seems to me increasingly that nonmilitary defense is important and in the years to come it should be of increasing importance. Certainly one of the important things that we need to do in the beginning as to that is to try to determine its relative importance in terms of the size and status of nonmilitary defense.

In this role it seems to me this committee can render a very valuable service. This is something that, at least in my experience, it has been difficult to get out of the military. I suspect the reason for it is that the Defense Department feels that, first, if they make too strong a statement in this, it is an expression of weakness or incompetence on their part, which, of course, it is not.

The second reason that I imagine makes them want to keep silent instead of expressive in this field is that they are fearful that perhaps some funds might be diverted from the military that they need. In the original project, East River; there was a report on military measures precedent to a manageable civil defense. On this we had a pretty controversial time and out of this experience it is my belief that it will be very difficult to get the Defense Department to express itself very clearly in this field. Perhaps this is a role in which this committee can perform a substantial service.

Mr. HOLIFIELD. On this point, General Nelson, we have very clear statements from the Chiefs of Staff in regard to their attitude toward taking this responsibility in addition to their other responsibiliies, and they have very clearly said they do not want this responsibility. They have also very clearly said that they think a civilian organization

should be built up. They have not, of course, advocated spending any sums of money toward accomplishing this.

Mr. RIEHLMAN. Mr. Chairman, it is also true, too, that they have in their statements led this committee to believe that they think it is a very important program and one that should be properly set up and administered and carried out. They recognize the need for it. Am I not correct?

Mr. HOLIFIELD. Yes; I think we have drawn out of them by questioning an admission that this is an important segment of our overall defense posture and that there is a need for more emphasis on it.

Mr. RIEHLMAN. May I make one other suggestion, Mr. Chairman? In view of the fact that Mr. Nelson is interpolating on this whole address here, I wonder if it would not be well to have it completely inserted and, as long as he is not going to read it, that he insert his whole presesentation in the record and then go on from there.

Mr. HOLIFIELD. I think that is a good idea. We will insert your statement as you have prepared it here because we don't want to lose any line of it.

Some of us have read through it. I suggest that you go ahead just as you are, informally presenting your views on it and interpolating wherever you wish.

(The document referred to is as follows:)

STATEMENT OF OTTO L. NELSON, JR., VICE PRESIDENT IN CHARGE OF HOUSING, NEW YORK LIFE INSURANCE CO., DIRECTOR OF PROJECT EAST RIVER, AND CHAIRMAN OF THE 1955 REVIEW

By inquiring into the status and problem of nonmilitary defense, this committee, in my opinion, is rendering a most important service to our country. I am, therefore, very glad to accede to the request that I appear and present my views as an individual citizen. The invitation to do this undoubtedly arises out of my work on project East River and the 1955 review of the report of project East River, which was a study of our nonmilitary defenses contracted for by the Department of Defense, the Federal Civil Defense Administration, and originally the National Security Resources Board, later the Office of Defense Mobilization.

May I say that, in general, both the original project East River report and the 1955 review are pertinent to this inquiry, and may I respectfully invite the attention of this committee to the conclusions and recommendations contained therein. Those reports go into much greater detail than I can hope to do in my appearance before this committee. However, I do wish to take this opportunity to reiterate, emphasize, and elaborate upon some of the points made in the East River reports. May I say also that I agree completely with the views expressed by Lloyd Berkner and Richard Emberson in their prepared statements for this committee.

In outline, I should like to present my views on the following:

(1) The need to determine the relative importance of nonmilitary defense in terms of our overall defense program in order to establish the scope, size, and proper cost of a nonmilitary defense program.

(2) The kind of organization that is required to carry out this program.

(3) Some of the basic principles that ought to be followed in setting up our nonmilitary defense program.

Perhaps at the outset I should define what I mean by nonmilitary defense. To my way of thinking, it includes civil-defense measures, both prior to and after attack; the entire series of measures relating to the reduction of urban and industrial vulnerability; and those emergency steps that are involved in promoting continuity of government, industry, and essential services with all the rehabilitation, restoration, repair, rationing, priorities, and allocation of materials and facilities that are critical. Perhaps another way of putting it is to say that nonmilitary defense relates to those measures primarily involving our civilian population and economy.

Nonmilitary defense, in my opinion, is highly important, and in the years to come will be of increasing importance. The relative importance, size, and status of nonmilitary defense are questions which, so far as I know, have not been very well answered by either Congress or the administration. Perhaps it might be well to describe briefly the various views that seem to have some measure of acceptance.

First of all, there are those who believe that nothing should be done and no money should be spent at all on nonmilitary defense. This view holds that the United States should spend its money and expend its resources on a strictly military defense program in the belief that in this way we get the most for our money and that, as a minimum, we need to spend all that our economy can afford on our military fighting forces. In effect, our people, cities, and industries have to be considered as expendable because it either costs too much to defend them or, no matter how much is spent, the defense is still ineffective. This view holds that a calculated risk must be taken with respect to our cities, industries, and people and that our overall defense is best served by spending all available resources on strictly military defense.

A second view is quite close to the first, except that it supports a minimum nonmilitary defense program that is admittedly inadequate and ineffective. I suppose that essentially this is a sophisticated attitude which would lead the people of the country to believe that some effective steps were being taken for their protection in an atomic age, although actually the program is so ineffective as to be a total waste of the funds involved. Perhaps an extreme way of putting it is to say that, under the concept, one considers the nonmilitary defense task to be so difficult, complex, and expensive that there is no practical or effective solution. However, this is not to be admitted publicly but instead an ineffective, phantom program is set up with appropriate individuals and agencies to serve as scapegoats if such are needed at a later time, In a sense, one might say that this is a "cover plan." Such has been used in military operations in an effort to delude the enemy that military activities were going on in an area with a view toward later military operations which, of course, were not contemplated. In the field of nonmilitary defense, I doubt that such indications of a nonmilitary defense cover plan with ineffective activity would delude an enemy, but it might lull the general public of the United States into a false sense of safety in this atomic age. I suppose the justification for such an attitude is the feeling that for political reasons something must be done, so you make a gesture in the absence of any effective program or the knowledge of how to undertake one.

A third view is that nonmilitary defense ought to be a vital and continuing part of an overall and balanced total defense program. This view recognizes that our active military defense forces should have first claim on the defense funds that are available. Certainly, a strong balanced armed force of land, sea, and air elements is needed, capable of fighting an atomic war or available to block the Soviets' use of power politics through satellite countries where recourse to atomic weapons might be avoided. In addition, there is neeed the continuing maintenance of the military might needed to strike a crushing retaliatory atomic blow against an aggressor. Likewise, there is the need for an effective early warning system with an air and guided missile defense with the potential that under favorable circumstances, a substantial part of an enemy striking force would be destroyed before it reached the critical targets in the United States. Last and by no means least is needed a program of nonmilitary defense which would make our centers of industry and population less lucrative targets, both in terms of becoming more and more difficult to attack and of making such attacks less worthwhile because of continuing increasing ability to survive, no matter how severe the attack.

This concept of a balanced defense program, in which nonmilitary defense plays an important part, involves a determination of the part each element of the entire program ought to play and how much, relatively, ought to be spent. This is to say that after the Armed Forces have been allocated substantial funds, there is need to know at which point additional funds will buy more for overall national defense, if spent for a nonmilitary defense program. As an illustration, let us assume that with a $32 billion annual budget, the Armed Forces can provide the essential basic military elements needed. Let us further assume that if needed, our national economy and our tax structure can support an annual charge of $35 billion for overall national defense. Then one should know if the 33d, 34th, and 35th billion should be spent, and if it is to be spent, where we

will get the most for our money. Maybe it should not be spent, perhaps it should be spent on the Armed Forces, perhaps it should be spent on military or economic aid to our allies, and perhaps it should be spent on an effective military defense program. Certainly this is an important determination concerning which there appears to be great diversity of opinion and resulting confusion.

It is my view that our country should have a well-balanced defense program in which nonmilitary defense should occupy an increasingly important role. It seems obvious that in any major war of the future, atomic weapons will be used. Certainly each of the great powers is placing major emphasis on the development and use of atomic weapons, with the entire structure of their weapons systems and their military organization being adjusted for such use. In war, the use of overwhelming force is the only prudent course to follow; anything else is risking catastrophic defeat.

No matter how repugnant and deplorable this appears to all of us, it is essential, first, that our people recognize the revolutionary impact of atomic weapons and, second, that our country do its best to adjust to this colossal change. Failure to do so may well place us and our country in that doomed category of individuals, institutions, and nations that have perished in the past or will perish in the future because of unwillingness or inability to adjust to major environmental changes.

Grim as is this prospect that atomic weapons of a destructive capacity rated at many, many millions of tons of TNT will assuredly be used in any major war, there is, it seems to me, a less dismal side to the picture. It is this. In this atomic age, preparations can be made and steps taken which will act as strong deterrents and persuaders against the starting of any major war which perforce must be an atomic war. The most potent deterrent, of course, is the continuing maintenance of the militray might needed to deter aggression.

But increasingly an effective non-military defense program can be another strong deterrent to an aggressor. It could become the critical, determining factor that might persuade the Soviets, in even a period of great rashness and madness, that they should not risk an atomic war. Let me illustrate may point by citing one relatively minor step that could be taken as part of a nonmilitary defense program. This step, which is not too difficult, would be to seek to obtain a blanced 30 per cent of our gross national production outside of the metropolitan target zones which the Federal Government would designate. The 30 percent level is suggested as a first objective because it has eben estimated that the present productive capacity of the Soviet Union is about 30 percent of our present level. Informed opinion indicates that the United States is not too far away from this 30 percent goal although it is not quite so well off in terms of a balanced 30 percent. So that the goal of achieving a balanced 30 percent of our gross national production outside of our metropolitan target zones is not too difficult to achieve and is highly practical.

If such a goal could be accomplished within the next 5 or 10 years, and I believe it can, what would be the practical advantages of such a course?

To me, the great advantage is that such an accomplishment would add greatly to our chances of maintaining peace and to our chances of victory if an enemy should strike. The Soviets would then be confronted with the sobering realization that even if they were successful beyond all reasonable expectation in overcoming our active military and air defenses and in driving home an atomic attack against all our great centers of production and population, there would still remain an industrial capacity and a productive might equal to that existing in the Soviet Union before the awesome power of our Strategic Air Command was unleased in terrible retaliation. Certainly, the existence of a balanced 30 percent of our gross national production distributed throughout the country and outside of our great metropolitan areas is a tremendous force for the maintenance of peace that becomes of increasing importance as the power of atomic weapons increases and as the capabilities of weapons delivery systems are increased and improved.

Beyond the strictly national defense aspect, there is another important advantage. To my way of thinking, such a program is worth doing strictly on the basis that it will increase the economic and industrial health of our country and is justified solely as a peacetime measure. This could be an orderly way of promoting superior industrial facilities located in a setting that would make for increased industrial efficiency. Delays due to congestion and the tiring frictions involved in difficult home-to-work and work-to-home journeys could

be reduced with resulting increases in worker efficiency and production procedures.

In addition, it should be said that this kind of industrial decentralization is very much the present trend. All that is needed is some Federal leadership, incentives, and informational guidance that will make it easier for willing individuals and industries to cooperate in a manner that will produce the results to be desired in the interests of national defense.

I have discussed the need for determining the degree of emphasis which should be given a nonmilitary defense program because I think it is highly important to any proper solution of the problem. I believe strongly in a balanced overall defense program in which nonmilitary defense is an important and permanent part of the program. This was the third alternative which I discussed. This we do not now have. I am sorry to say that, in my opinion, our country is operating on the basis of the second alternative wherein a most ineffective gesture is being made and where the money that is now being spent is largely wasted in that our present nonmilitary defense program is so ineffective and fragmentary that it is worse than no program at all. It is my strong recommendation that instead of following our present course, the country should face up and decide which of the other two alternatives it is to follow. Either we should decide to forego entirely a nonmilitary defense program and use all available funds for the support of the Armed Forces or we should adopt an overall defense program in which nonmilitary defense is an important and effective part. This, I hope, is the solution which will be followed. Above all, the people of our country need to understand the situation and what is to be done about it.

Next, I should like to discuss the kind of organization needed to carry out an effective nonmilitary defense program. As a preliminary, it is desirable to state how it should not be done.

In my opinion, it would not be wise to turn over any part of the nonmilitary defense program to the Armed Forces and to place it organizationally with the Department of Defense. In the early stages of Project East River, this question was discussed at great length. At first we were strongly tempted to suggest that civil defense be turned over to the military. Here are some of the reasons which influenced us finally to recommend against such a course.

The Armed Forces should not be diverted from their offensive, interceptive, and defensive missions in order to undertake what must remain essentially a civilian responsibility. If civil defense were to be made the primary responsibility of the Armed Forces, the effects would be reflected now in larger troop requirements and, in the event of war, in heavy pressures for the diversion of additional manpower into civil defense at the very time such manpower would be most needed to increase the Nation's offensive striking power. The functions of leadership, planning, and operation of civil-defense programs are so closely intermixed with the normal day-to-day functions of civil government and affect so intimately the lives of our citizens that the extension of military direction and control in this area should be avoided.

An even more serious objection to turning over nonmilitary defense to the military is that from a practical point of view the problem cannot be solved, in my opinion, in this manner. One of the great handicaps to any practical and effective program of nonmilitary defense is the all too general belief on the part of many citizens that in an emergency the military would have to take over, so why worry. There is an all too widespread belief on the part of too many mayors and governors that nonmilitary defense is completely a Federal responsibility and that they should and can disavow any responsibility for the program. The plain facts are that there are not enough people nor enough money for the military to do the job on any separate, professional basis. The only possible way that the job can be done is to use existing agencies of town, city, county, and State governments as well as most of the major departments in the Federal Government. People doing comparable work in their main job must be utilized and must expect to take, in an emergency, assignments in nonmilitary defense. Likewise, volunteers who are already holding down a useful normal job in the community must expect to assume an emergency role. There is no other source of manpower available or competent to do the job. Mayors and governors cannot be permitted to default on what are the basic responsibilities of their offices. The illusion that mayors and governors can stand aside while the Federal Government moves in to do the job and the attitude of some citizens that they can stand on the sidelines while the military come in and take care of them in an atomic attack are

the most dangerous hoaxes that could be perpetrated on the citizens of our country. Somehow the record needs to be made abundantly clear that in time of atomic danger, the people must look for their immediate salvation to their own resources and those of the local, county, and State governments that are closest to them. The Federal Government must, of course, provide leadership and far more financial assistance than at present. The job cannot and should not be done by diverting the military from their proper and all-important role of taking active military measures to inflict military defeat on the enemy.

Even though the nonmilitary defense program remained an essentially civilian program involving civilian agencies of local, State, and Federal governments, it would be undesirable, in my opinion, to place such an operation in the Department of Defense or assign it as a responsibility of the Secretary of Defense. This is not to say that there might not be substantial advantages in so doing. My principal objection to such a solution is that it would endanger the Secretary of Defense's ability and effectiveness in coordinating the armed services. At the time the offices of the Secretary of Defense and the Defense Department were established, there were many who believed that this palced too much authority and responsibility on a single individual. I believe that the establishment of the Defense Department has improved the overall coordination and efficiency of our Armed Forces, but it has also placed upon the Secretary of Defense more responsibilities and burdens than should be placed on any one individual. In fact, one very able Secretary of Defense told me that the responsibilities and duties inherent in the job were so far beyond what any one man could handle effectively that the rule should be to take away from the Secretary of Defense and the Department of Defense any responsibilities and duties that could reasonably be assigned elsewhere. This is a good workable rule that ought to be followed to protect and preserve the ability of the Secretary of Defense to coordinate and direct the operations of the Armed Forces. Under this rule, one certainly would not endanger the effectiveness of the Secretary of Defense in directing the Armed Forces or add to his already too great responsibilities by having him take on a highly complex and difficult nonmilitary defense task, particularly under circumstances where citizens as well as local and State officials are trying to "bow out of the picture" and let the Federal Government do it all.

So much for the negative side of how nonmilitary defense should not be organized.

Certainly, the status and prestige of both the Federal Civil Defense Administration and the Office of Defense Mobilization need to be improved, and their respective roles better coordinated. This could be done in several acceptable ways. The two agencies could be consolidated or, with a better division of responsibilities, could remain separate. Cabinet status and membership in the National Security Council are needed for both. It would certainly help if the Federal Civil Defense Administration could attain the status of a permanent regular department of the Government or if, at least, it could be in the Executive Office of the President.

In my opinion, organization changes can bring improvement but only if accompanied by a pronounced change of attitude on the part of both the administration and Congress. You can select the most talented individuals in the country and provide the most effective organizational framework possible, but the nonmilitary defense program of the United States will never become effective so long as you relegate it to its present minor position where it receives scant time, emphasis, or attention from either the administration or Congress. At best, it is a most difficult and complex undertaking to carry out even if it had preferential treatment and strong support from both the President and Congress. At present, it is my impression that both the Federal Civil Defense Administration and the Office of Defense Mobilization occupy the role of unwelcome poor relations which both Congress and the administration would like to ignore and keep out of their own and the public's sight and attention because they present such disturbing problems.

In setting up an effective nonmilitary defense program, I would urge that the principles set forth in both the original Report of Poject East River and in the 1955 Review of the Report of Project East River be followed. For purposes of emphasis, I should like to reiterate certain of those principles:

1. The Federal Government must assume the leadership and primary responsibility that is inherently theirs. By this I mean that there must be agreement and emphasis on the Federal level that nonmilitary defense is an important and permanent element of national defense in an atomic age. Further, there must

be a workable and effective program evolved that is well coordinated with our overall national defense program.

2. The Federal Government must finance a large part of the program and set the example in their own housekeeping of what they would like State and local governments as well as business to do. A most appropriate biblical phrase is "For if the trumpet give an uncertain sound, who shall prepare himself to the battle?"

3. Maximum use and reliance should be placed on the full use of local and State governmental facilities aided by all possible help from both the civilian departments of the Federal Goverment and from the Armed Forces to the extent their temporary assistance is feasible without their becoming primarily responsible for the operation.

4. Because of the power of high-yield nuclear weapons, effective and practical nonmilitary defense must be organized and operated on the basis of metropolitan target zones.

Because the metropolitan target zone concept is vital to any effective nonmilitary defense program, I should like to describe in detail how it could operate.

As a preliminary, it should be stated that our cities and great urban areas are essential to the maintenance and growth of our industrial efficiency and our economic system. I am not suggesting any program which contemplates the gradual abandonment of our great urban areas. This would be neither practicable nor desirable. The United States has a number of great industrial and heavily populated areas which have grown up slowly over many years. The task is to develop a method whereby as these areas grow or rebuild, miximum advantage is taken of the opportunity to not only reduce our vulnerability in the event of an atomic war but also to increase our industrial efficiency and our living comforts in time of peace. In my opinion these twin objectives are the same.

In the past, there has been difficulty in bridging the gap between Federal planning and direction as a matter of national defense and local acceptance and execution. I believe that this gap can be bridged if the responsible Federal, State, and local officials sit down together and formulate jointly what could be called a metropolitan target zone nonmilitary defense plan especially tailored to meet the needs and possibilities of each of our large metropolitan areas. Here is how such a program might be started. Initially, the Federal Government should be expected to supply the funds necessary to carry out needed studies and to prepare the initial program. After agreement has been reached on the boundaries of a given metropolitan target zone, a modest program could be formulated under a limitation that every part of the program had to receive the unanimous approval of the responsible local, State, and Federal officials. It would be desirable to revive the program each year, and there should be sharing of the costs involved among the affected State and local governments, with the Federal Government paying for a substantial share.

Initially, a metropolitan target zone plan for a given year aimed at reducing industrial and urban vulnerability could focus attention on certain projects that should meet with complete public approval and acceptance. No one would object to steps being taken to insure throughout the entire metropolitan target zone the continuity of such essential services as water supply, electricity, gas, and other related items. Likewise transportation facilities and arterial highway development represent areas in which there is both great interest and desire for much needed improvement. Circumferential highways are also badly needed in all our metropolitan areas, and their construction would encourage healthy growth and rebuilding of industries which would not only enhance the economic efficiency of the area, but with better spacing would also reduce our urban and industrial vulnerability. As the workweek becomes progressively shorter in terms of hours to be worked, and certainly this is a trend that will continue, the need for wide open country for recreational purposes around our metropolitan target zones will become more and more pronounced—especially so, if you consider our population increase of over 3 million persons a year. What a natural and appealing step—to link recreational needs with national defense by providing permanently reserved open spaces between industrial and population centers.

After progress has been made in some of the more obvious and universally acceptable steps, the time would soon arrive when a metropolitan target zone would wish to prepare comprehensive industrial-use maps along with other important similar data for entire metropolitan area. The preparation of such information would be of great use to business and industry generally for purely

peacetime business use. With such information available, one would then know how much spacing out or scattering is practical and possible. Likewise, such maps and other accompanying data would reveal the extent to which there is the unhealthy concentration of similar plants of one key industry in the area. When such information is known and analyzed for each of our important target zones, then the question of appropriate incentives from the Federal Government to stimulate better rearrangement within the existing area can be answered.

For the present, I would be tempted to defer large scale citizen participation in civil defense tests. There is a very proper and useful place for large scale drills, but they can serve no very useful role until the nonmilitary defense program and organization are ready for such tests. The framework of an effective organization must be completed and frequently tested. The many physical improvements and adjustments needed in the various metropolitan target zones should get started. Until the stage can be set for large scale citizen participation in tests, it would be well to concentrate on educating each citizen on the nature of the problem and on what steps he himself can take individually to increase his chances of survival.

I could go on at length to elaborate on measures that might be most useful and practical in each metropolitan target zone to reduce its industrial vulnerability and to improve its peacetime industrial efficiency and economic potential. I am sure that most of you can think of many additional steps which can be taken. The point I should like to emphasize is that most of the steps which need to be taken in the interest of national defense ought to be taken anyway. The advantages to be gained in increasing industrial efficiency and in improving general living and working conditions are well worth the costs involved. As our population expands and our productive capacities increase, we must determine and stimulate healthy growth and avoid costly mistakes due to unthinking and haphazard expansion. The wide open spaces are not there any more; in many places we are confronted with the problem of crowding.

Up to the present, progress in the peacetime solution of these problems, for reasons other than those of national defense, has been handicapped by the fact that the problems cut across so many local and State governmental boundaries and jurisdictions. Because several States are often involved, there are both the opportunity and the need for the Federal Government to act in a coordinating capacity. For the Federal Government to attempt this in any capacity other than on the basis of national defense interest would immediately bring up the charge that the traditional Federal-State relationship was being upset. This, of course, would be highly undesirable. I believe that the activities which I have outlined can be carried out by local and State governments without violating our traditional concepts of government, but that at the same time the Federal Government can provide a useful coordinating service by bringing them together and in providing proper incentives, information, and leadership.

In the total nonmilitary defense program, there would then be these important elements:

1. Proper education and instruction of each citizen as to what he, as an individual, needs to know and needs to know how to do to best protect himself and his family in a dangerous atomic age.

2. Federal leadership and responsibility in the field of providing information and warning to our citizens.

3. Organization and operation of a nonmilitary defense system using primarily the civilian agencies of government and operating through the traditional Federal-State-local relationships but financed in large part by the Federal Government.

4. Utilizing the metropolitan target zone concept to bridge the gap between the Federal Government and State and local governments. By preparing and improving each year a metropolitan target zone nonmilitary defense plan for each of our large metropolitan areas, it is possible to undertake both long-term and short-range actions that will enable our people, our cities, and our industries to reduce their vulnerability to atomic attack.

Finally, may I say that I believe a practical and workable nonmilitary defense program can be achieved and at a cost that is not prohibitive. When such a program gets underway, it will help materially in maintaining peace. And as the program succeeds, the chances of atomic attack will be increasingly reduced. At the same time the country will receive as an extra dividend, so to speak, the many benefits which a nonmilitary defense program will contribute in making both our cities and rural areas better and more comfortable places in which to work and live.

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Mr. ROBACK. Since we had this little discussion about the role of the military may I ask a question?

The burden of the testimony of the military was that any diversion or amplification of civil defense responsibilities would tend to interrupt their military responsibilities, their military mission. That is the kind of testimony that could have been given anytime in our nation's history so to speak. In other words they presupposed a conventional or established concept of military mission.

Do you have any observation with regard to that attitude?

Mr. NELSON. I would like to come to that a little bit later. I have covered that I believe in my prepared statement.

First, then to consider what kind of a program we need and it seemed to me in going over this field with the help of many government agencies that there were really three quite different attitudes. One was a deliberate attitude that this task was so great, so complex, in fact so impossible, that you might just as well recognize that you can't do anything about it and that we should not spend any money on this.

What money we spend for national defense should be spent for hardware and for military personnel, where presumably we get something for the money involved. This view of course holds that our people and our economy and our industries have to be considered quite expendable in an atomic age.

I think the people who hold this view do so not so much because they want to be hardboiled about it but because of their inability to figure out a workable program at anywhere near reasonable cost. A second view that is quite close to the first is that it would support a minimum nonmilitary defense program that has to be and is admittedly inadequate and ineffective. I think the people that believe in this do so from a variety of reasoins. One is that they are dubious as to the effectiveness of any program that can be followed. Another is that we have not the money to spend for this. There is a limit to what our economy can stand in the way of national defense expenditures and the military needs so much of this that only a pittance can be given to this nonmilitary defense field and they have to go through the motions of working out a program that looks like it isn't too bad.

This has troubled me because as things stand now, the likelihood is to great that the present people that are working very hard and consciously on this are nothing more than scapegoats for almost a phantom program.

I don't mean that a great deal has not been accomplished. It would be wrong for me to disparage the efforts. Certainly what they have done to educate the individual citizen about it, about the atomic age, and what he should do and his family should do is good. The warning system that the military has established is excellent. But in terms of organization and the means to do something, I believe that most informed people would believe that if we had any atomic disaster, the organizations that we do have in the field would prove themselves inadequate and we would have to call out military help.

A third view is that nonmilitary defense ought to be a vital and continuing part of an overall and balanced total defense program.

Mr. HOLIFIELD. Before you go to that, would you not say that your description of the second view is the condition that we find ourselves in at this time to a great extent?

Mr. NELSON. Yes. By and large although I have been admittedly sketching when I have said it, yes.

Mr. HOLIFIELD. We are faced with a lack of comprehension on the part of the people with the seriousness of the need for an effective civil defense. We are faced with an indifference so far on the part of the Congress to grapple with this problem and to accord it the importance which it seems to deserve and I regret to say that we are also faced with the lack of what I would call top level leadership on this.

This is something without any degree of partisanship because it has been true under the previous administration and is true under this administration that we have not yet had the President, either Mr. Truman or Mr. Eisenhower go on the television and tell the people what the relative gravity of the civil defense problem is and the great need that there is.

Some of us on the committee cannot see how we are going to impress the people with the importance of civilian defense unless more cognizance is taken by the Security Council and by the Congress. This is a great problem however.

Mr. NELSON. That is true. There is this vicious circle it seems to me. First of all you have had so much classified material that it has been difficult for the people to understand the problem. With the lack of understanding and interest on the part of the citizens there has been an understandable and corresponding lack of interest on the part of Congress. The result has been that no very good program has been adopted because of inadequate funds and, with the funds available they have only been able to make a gesture.

I suppose the administration has been worried about this, and has been somewhat frustrated to know what should be done about this. The result has been that the program is ineffective. The reaction of most citizens is that the program doesn't amount to much. So you have this sort of vicious circle.

Mr. HOLIFIELD. So many of our people have had military experience, some 16 to 18 million in recent years and I have talked to many of these people in veterans' organizations and they have just said that the reason we are not participating as individuals in a program is because no program has been advanced to us which gives us that which our commonsense can approve of.

Mr. NELSON. I think that is right.

Mr. HOLIFIELD. And you just can't get them interested in it because they won't go around carrying a tin bucket and a shovel and wearing a helmet like they did in World War II.

Mr. NELSON. In fairness you must say that many changes have occurred in the past 6 or 8 years and that there has been just terrific change in the improvement of the weapons.

Mr. HOLIFIELD. That is true.

Mr. NELSON. We have made such substantial progress from the 20,000-ton bomb of the Hiroshima day to the 50 to 60 megaton bomb of the future that one can hardly expect that any organization that has gone through that kind of a change can do so without great difficulty and a certain amount of temporary ineffectiveness.

Mr. HOLIFIELD. As long as that change has occurred and it has been established beyond doubt that it has occurred, does it not call for a

complete reevaluation of our total concept of defense and the purpose of our defense?

Mr. NELSON. Well, it seems to me this is a particularly good and propitious time to do just what this committee is doing. We have gone through such a tremendous change in weapons, but we have reached the point, in my opinion, where the H-bombs are so powerful that no matter what happens in the future, what we do now is appropriate for anything that might happen in the future. Also in my opinion the rules and procedures and organizations that can be established now would be quite appropriate for the day of the long-range guided missile. So I think that for the first time we are in a position to say there is no longer any good reason to procrastinate.

You can't say let's wait to see what is happening. They are getting weapons bigger and bigger, and already the weapons are bigger than we need.

Mr. HOLIFIELD. That is an important point. When you once achieve the strength of a single weapon which can destroy any of our urban centers, then regardless of how far you go beyond that, you have already got your problem outlined before you.

Mr. NELSON. That's right. I don't think it would change the principles of nonmilitary defense. When you begin to get weapons of the size that overkill, then how much more they can overkill is not very pertinent.

To go on, I feel quite strongly of course that we need a balanced defense program in which nonmilitary defense can play a very important role and one that would it seems to me should increase as time goes by. I have been concerned that there hasn't been as far as I know, any real overall study to try to determine after you have spent a sizable amount on the armed services where additional sums can best be put to use and placed most effectively.

This is something that I don't think you can expect the Joint Chiefs of Staff to do, in all fairness, because while as a body they are the best brains that we have on military policy, I think you can't fail to remember that individually they are operators, they are there to represent the Army, the Navy, the Air Force, and so it is sort of hard to ask the person who is a claimant for money for their own use to serve in the role of a judge in a field that is vastly greater than they really feel they ought to be forced to take cognizance of. This is basically a problem, it seems to me, of the National Security Council, but unfortunately there is no one in the National Security Council that I know of at the moment in terms of stature, nor who can really bring this question up and get it thrashed out in the way I would like to see it examined.

I think efforts have been made on this and some progress is being made, but again this is a field where I would think this committee can very properly spur action.

In stressing the importance of a well-balanced defense program may I also emphasize that I am personally quite enthusiastic about what can be accomplished in terms of nonmilitary defense.

To cite the example that I gave in my prepared testimony: While we cannot abandon the arms race such as we are having now in this troubled world, we could supplement this, by a nonmilitary defense program which would have tremendous peacetime benefits. In addi-

tion this would make the enemy understand that no matter what they attempt to do to us, they can't in one blow destroy us, that no matter if they are overwhelmingly successful, say, in initial strikes that they cannot destroy our industrial capacity, that we still can come back and retaliate. The figure that I used was that if in one part of the nonmilitary defense program we could get a balanced 30 percent of our gross national product, located outside what I call metropolitan target zones, it seems to me this would be one of the most powerful deterrents to war that I could think of. Certainly if the Russians understood that if they were successful beyond their fondest dreams in overcoming our military defenses on an atomic strike against our country, if they realized that after they had done their best, we still had as much industrial capacity as they have now—and they have about 30 percent of ours—if this was made well known to them that no matter how successful they might be on a military strike, we still had the same industrial capacity as they have before we unleashed our retaliatory force, I can't think of a stronger force for peace and a stronger base from which our diplomacy could be exercised to bring about a condition in this world whereby things would get better without resorting to war.

So just in that factor alone—and I think you could illustrate similar things that could be accomplished—I think this is not a difficult goal. At the present time we have practically 30 percent in many, many things in industry located outside of our metropolitan target zones.

It is just a problem of getting a balanced 30 percent. Going on now and I shall skip some of my testimony inasmuch as it is going to be put into the record, I would like next to turn to the kind of an organization that seems to me to be needed to carry out an effective nonmilitary defense program and as a preliminary it is important it seems to me to state how it should not be done.

In my opinion it would not be wise to turn over any part of the nonmilitary defense program and as a preliminary it is important it organization within the Department of Defense. In the early days of Project East River we spent a tremendous amount of time on this, because superficially it was very, very attractive. Our reasoning was it was quite clear from all our investigations that if the United States was to get into an atomic was there was no question but what the civil defense organization and the other things that we had that they would prove quite inadequate and there would be no choice but to call in the military.

However, after we went into this at length and after we had had the benefit of some very sage advice from some able people, we finally concluded that this would not be the wise thing and a good thing for the country. In the first place is seems to me that the Armed Forces should not be diverted from their offensive, interceptive, and defensive missions in order to undertake what must remain essentially a civilian responsibility. If civil defense were to be made the primary responsibility of the Armed Forces, the effects would be reflected now in larger troop requirements and a larger budget and in the event of war heavy pressures for the diversion of additional manpower to this field when they were really needed in our active military forces.

And then, too, the functions of leadership, planning, and operation

of civil defense programs are so closely intermixed with the normal day-to-day functions of civil government and they affect so intimately the lives of our citizens that it seems to me the extension of military direction and control in this area should be avoided.

Even more serious an objection is that I don't believe the problem can be solved in this manner. It would seem to me that this is something that really needs to be put before the country. A good part of the apathy that does exist today among citizens is that they feel, "Oh, well, if we get into any trouble they will send the troops in and there is no use of our getting excited." I think if it could be demonstrated to the people of our country that this is a false hope, that this might help to stimulate some of the apathy.

It just seems to me there isn't money enough in our country, there are not people enough to try to do this nonmilitary defense job on what I would call a professional basis, that is by turning it over to the military. I was acquainted with our manpower problems in World War II. It was the most serious problem we had, much more serious than materiel. I am sure it is going to be increasingly serious. There just are not the people that can be put on this kind of work exclusively. There is not the money available. Really there is no choice on handling this problem except to have it generally understood that the people in local, county, and State governments who are doing comparable work in normal peacetime, that they must take an emergency assignment in this field. A new dimension must be added to local, county, State and Federal governments which would require that people who are doing a comparable job normally would be expected and would be trained to do this emergency job when the situation confronts us.

This has to be done because there isn't any other way in my opinion where you can find the people.

This doesn't mean to the extent that the military and other Federal Government departments can help that they should not help the locality but I think it should be made abundantly clear that it is a tragic hoax that would be perpetrated on the American people to feel that somehow, somebody is going to take care of them in a time of atomic disaster, because no one can take care of them, except the people that are closest and nearest to them.

I don't blame any of the mayors and governors I have talked to—and I have talked to a great many of them—from being sort of astounded and shocked by the dimensions of the problem that they are supposed to take over under existing arrangements. They feel it is far beyond their resources. They don't have the money for it. And it is only human that they should try to shrug their shoulders and say this is not their responsibility. This must be a responsibility of the Federal Government.

But I don't see that this is possible. Mayors and governors cannot very well absolve themselves from their tremendous responsibility in this field. They would be defaulting, it seems to me, on the responsibilities of their office, if they take an irresponsible attitude, toward this problem. It is an important task that they would have to face and in an emergency I am sure every single one of them would rise up to it and say this is where they can do the most good for their people. This is part of the responsibilities of office.

Now I would admit that they certainly need far more help in terms of financial support and leadership from the Federal Government, but to put it very vulgarly, you shouldn't permit the mayors and governors to get off the hook in this whole field of nonmilitary defense, because their services are vital and the services of their entire organizations are essential and in fact there is no one else that can do the job.

And I think this has not been made clear.

Mr. HOLIFIELD. But isn't this all based on the premise, No. 1, that they have what you might call a master target area planning, supplied by the Federal Government in cooperation, in coordination with them on a consultative basis of course, but in the last analysis a prescribed Federal plan for each target area which would be integrated with other target areas; and as far as the planning is concerned isn't it true that such as that I have described is needed.

Mr. NELSON. I think that is right.

Mr. HOLIFIELD. It can't be done by the individual mayor of a large city. He just does not have the information and the experience and the knowledge concerning other communities which may be overlapped by a radioactive pattern or by conflicting plans for transportation or evacuation or other necessary ingredients to a successful plan. It must be done on a coordinated basis, it seems to me.

Mr. NELSON. I think that is right.

Mr. HOLIFIELD. The Federal Government is the only one that I know that can furnish that integration and that coordination between the different political subdivisions.

Mr. NELSON. I think that is fair. I think it is only fair to say that as things are now, I don't blame mayors for disclaiming any responsibility in this field in the absence of a more workable program. I know in the case of Mayor Cobo of Detroit and Mayor Richelle of Oakland and Wagner of New York, I know all of these people have given great thought to their problems and responsibilities and have been most anxious to do everything within their capabilities that they could do but I think at the present time they feel that the job is quite hopeless in the absence of a means of better ability to get at the real roots of the problem.

Mr. HOLIFIELD. We have letters from practically all the governors and the mayors of our large cities and the burden of most of those letters is that they haven't received planning assistance and instructions from the Federal Government. We do not believe that a bomb falling on our city is just on our city, it is just on the United States.

Mr. NELSON. I think that is a fair attitude.

Mr. HOLIFIELD. They approach the financing problem also in this manner. The individual cities or States are not called upon to pay individually for carriers or for planes. The general population is taxed to support our military defense, that this is an important backup and necessary ingredient of our overall national defense. Why isn't it just as necessary, just as much a part of the Federal obligation to finance out of Federal funds as it is to finance the military expenditures for manpower and equipment.

This seems to be the general feeling.

Mr. NELSON. I think that is quite true.

Mr. HOLIFIELD. If that general feeling exists and if there seems to be a lack of progress in this field, it seems to me like the obligation

of the Federal Government, which after all does have the responsibility for our common defense, including the Congress and the executive branch. It seems to me we have to take recognition of that general feeling on the part of the people and supply that part of the ingredient which is missing and which is necessary to have an effective civilian defense, recognizing exactly what you have said about the obligation of the governors and mayors and the people themselves, that without their full wholehearted cooperation and participation you can't have it by Federal help alone.

Mr. NELSON. I would like to comment further on that, if I might under two headings. I would like to start with the status and the organization of the Federal agencies. I have made some comments in my prepared testimony but I would like to add to that by saying that I felt what you would put in the bill you introduced would be very useful. Certainly anything that is as new and as difficult as this task deserves real topside attention and priority. In any business endeavor where you are starting a new department or something new this is done. This is the kind of thing that usually gets the special attention of the Chief Executive; this is the thing that the directors are very much interested in because it is new and a problem. So it would seem to me that using that analogy it would be quite appropriate for much more top attention to be paid by both the administration and Congress to this field that is both new and very complex.

I am aware that this can be done in a number of ways, but certainly I think it is fair to say that this attention that is so badly needed has not been given as yet. When a large business organization starts a new plan or launches a new product, it would never succeed unless it gets the very special attention of the chief executives and the directors of the firm and that seems to me to be what is needed.

Now as to how this local interest and local resources can be meshed with the Federal program, to me there is quite the problem in getting over what I would call the traditional Federal-State relationship. Certainly I would not be one that would suggest that we ought to change them. The problem is how can you continue to have them and yet in the face of this new need what can you do? It was with that thought in mind that our Project East River review committee suggested that because the atomic weapons of today are so powerful that the problem was much greater than could be taken care of by any one community. We therefore felt that metropolitan target zones should be established for each of our general great centers of population and industry. We believed that if you would accept that concept that organizationally a great many things could be done. You have to do some of these fairly slowly. If you take any one of our great metropolitan centers and designate a representative of the Federal Government to sit in with the designated representatives of the governors and mayors involved you would then have an effective ad hoc committee. If the financial resources would be provided by the Federal Government you could then start on a nonmilitary defense plan that would be appropriate for that particular area.

It would have to be one that makes sense. It would have to be one that is reasonably useful by the standards of the people that live there.

It might be that what you would do in one area might be quite different from what you would do in another area. I would even go

so far as to say that what you do initially ought to be things that would receive the unanimous support of the people that served on this ad hoc committee.

In that way you could come up and present to the Congress of the United States not programs that are so sketchy that you wonder if the money is being well spent but you could then bring to the Congress of the United States a very concrete and precise program as it pertains to each one of our large metropolitan centers, a program that could be backed up with budget estimates and a basis upon which there could be some sharing of costs. There would then be agreement on who does what. It should not be too difficult for that to be done because I think that there are enough peacetime benefits that would cause a program like this to be bought by all the local people involved.

I would feel that if you could use the device of a metropolitan target zone to unite the efforts of the Federal Government, the States involved and the principal cities involved on a program that might be modest at the start but a program that could be universally accepted by the people concerned in each area and if you could bring these figures up and get them approved and get the thing started then each year you could come back and build upon the program that you have started. I would be tempted in such a program to not at the moment pay as much attention as is being paid to the participation of the individual citizen. I think what has been done was necessary.

It seemed to me that you have to indoctrinate the individual citizen on what he ought to know about the atomic age and what he and his family can do by themselves but after you finish that initial indoctrination, then it would seem to me that you would go from there to a program of developing a staff organization and an operating organization that could function in time of an emergency.

And I would be tempted to build on going organizations. It would seem to me if you could have a civilian adjunct to say the police forces of our major cities, by citizens who would be deputies and who would serve as auxiliaries to the police, to the fire department, to the State police, you would enable some of our local governments to do a far better job than they can afford to do now.

Very properly some of this money should be provided by the Federal Government. You could go ahead and do certain things that are badly in need of being done now. Such measures would greatly increase the capacity of our metropolitan centers to survive in time of disaster. As an example consider a program to improve the continuity of utility services. It wouldn't take very much money if properly used to make our great utility systems that serve each metropolitan center three times as effective as they are.

Just as an illustration, of my own personal knowledge, the housing department runs out at Long Island a 186-acre housing development called Fresh Meadows where we have 3,000 apartments, a main shopping center and two neighborhood shopping centers. All this is served by one main heating plant. And if for any reason our electrical services go out, we must pull the boilers within a minute and all heat ceases. We have for our own continuity of utility services done a number of things.

We have got lines that come in from two separate generating stations. We have considered the necessity of standby powerplants.

But this is merely a very small illustration of what can be done on the local scene, which is very important to business and industry and the locality, to make the services upon which our economy is so tremendously dependent more likely to continue under any kind of disasters of which we have a number of different kinds.

It would seem also that one of the things that is hardly needed in every metropolitan center as we shorten the workweek, which we are doing all the time, is the necessity for additional recreational facilities. What could be a more perfect combination than to somehow provide these recreational facilities by reserving permanently open spaces that are on the fringes of our great metropolitan area, which are rapidly disappearing at this time.

The thing that is going on all over the country is what you might call Brooklynizing. By that I mean you have one block after another of housing and apartments, improper type of building so you greatly increase the frictions of working and living. Certainly one of the things that would enable our great cities to survive in an atomic age would be great wide arterial highways that would go out from the center of the city that would be several thousand feet wide. These really would be great green belts with multi-laned freeways going out to places where there would be permanetly reserved open spaces and by that I mean these would be parks, not under the Federal Government but under the localities with incentives provided by the Federal Government as a means of national defense.

These are also localities where the Federal Government needs to put Nike batteries which they are doing in many of our parks. There is the necessity from the national defense point of view that as we get these guided missiles for anti-aircraft purposes, you have to provide so if you aim them in the normal direction in which they are to be aimed, you have an area of fall for these projectiles where they won't do as much damage against your own people as they can do if they just fall indiscriminately. Without trying to go into many of the details, it would seem to me that by utilizing the metropolitan target zone concept, you would get willing people, that the city, country, State and Federal level to sit down and year by year work out each year a program of nonmilitary defense which would do these things. One, it would beef up the local governmental activities by providing voluntary deputies that could be of substantial assistance to the local people. It would provide local resources so that you can have open spaces, you can have problems of adequate water, continuity of utility services, of the sewage problem, the road problem, a whole host of things for which there is now no machinery so far as I know how these things can be handlel as they refer to a great metropolitan complex.

I know that in the field of local government and in the field of say, university research, this problem of the metropolitan area is considered to be the foremost problem that we have in this country in the decades to come. And it would seem to me that maybe this is one of the ways that this nonmilitary defense program can get some appeal to it, can get some positive acceptance, can get some people coming down from localities to Washington and say "This we want. We think it is important for national defense. We think it is highly important for normal peacetime living and working."

Mr. BALWAN. How should all this get started? How do you generate the momentum for this?

Mr. NELSON. It would seem to me a good job could be done by making a start in say a certain number of metropolitan areas. A program could be brought down here, that might not be too expensive. I think you have to offer some financial inducements to make it very appealing. It would seem to me this would not be too difficult to get accomplished.

Mr. RIEHLMAN. Wouldn't that have to be inspired from the Federal level?

Mr. NELSON. I think it has to be inspired from the Federal level. I think some of the Federal agencies are working hard in this direction. I would hope that this could be supported strongly by Congress and the top people of the administration. Because it is difficult for an organization as far down on the organizational ladder as both ODM and FCDA are located at the present time to go to the governors and say, "Look, we have something that really is spectacular. This is something that is a great opportunity." It would seem to me that this is the way it ought to be done—it has to have real topside support.

Mr. BALWAN. You say that several agencies are working on this.

Mr. NELSON. Since our 1955 review of Project East River was submitted, I have been quite pleased to see that this concept of metropolitan target zones had been accepted by both the Defense Department, by the Office of Defense Mobilization and by the Federal Civil Defense Administration. I am a little fearful that some of the ways that they are proceeding won't bring them to where I would like to see them go quite as rapidly as the ways we have suggested.

But I certainly would not be one to say there is only one way to go about this. FCDA is trying to go about this through these survival plans.

I have some misgivings about them but perhaps they can get to the same place by what I would think is a little bit of a longer road.

I have talked in general. I am sure that Mayor Cobo of Detroit would be greatly intrigued if he could get in the vicinity of Detroit, say some of the open spaces that are needed to permit proper spacing of people and industry.

Mrs. GRIFFITHS. He is selling them now.

Mr. NELSON. Because he probably feels that the city can't afford to maintain them.

Mrs. GRIFFITHS. Mr. Chairman, may I ask a question on this?

May I point out to you that if we are to have this type of indoctrination, it is going to have to come from the Federal level. Let me point out that once you start with these States, with the governor and with the State legislature and with various mayors, you are going to run into this problem; first, that they are not going to realize what the whole problem is, and secondly that they are not going to care. Finally under any circumstances you are going to hit partisan politics. So the Federal Government stands in my judgment in the best position to be of any real value on an indoctrination course.

And I think it is going to take a great deal of money to do the indoctrinating. In this room right now I am closer to the capitol of Michigan than many of their State representatives are when they are in their own homes. So that a bomb hitting Washington would

have more effect upon Lansing than one hitting Lansing would have upon the Upper Peninsula of Michigan.

Mr. NELSON. I would agree with most of your comments except with possibly this reservation. It would seem to me that it would be a good thing for some partisan politics to be injected into this. This would get the problem thoroughly aired and would focus public attention on it. So I am not worried about partisan politics. I think it might cost some money although I don't believe it would have to cost as much as we might think.

I believe the basis upon which you could get local interest stirred up tremendously would be that there would be as, what you might call extra peacetime dividends of this program, which would have as its primary basis the fact that it would improve our national defense. There would also stem from it, it would seem to me, peacetime benefits that would be of such incalculable value that if this could be illustrated concretely by projects for each one of the areas, then it would seem to me that you would not have as much difficulty in getting local support as I think you feel there is.

I would even go further to say that I believe a program could be prepared that could be equally attractive to a great many of our rural areas. It would seem to me that some of the requirements of nonmilitary defense could certainly be used as a means of meshing together the things that are now being talked about in terms of conservation of water resources, that are being talked about as the farm problem, our highway problem.

It would seem to me that you might find that in a nonmilitary defense program a means of pulling these things together in a package that would have tremendous local appeal. I am not saying that the national defense aspect of this should be supported at the local level, but it would seem to me it would be possible to get the program started by picking out those things that have a tremendous benefit for national defense and that also have an equally important place for improved peacetime living and working in areas.

I don't believe it would take a very large appropriation from the Federal Government to staff a working committee in each of say 15 or 20 metropolitan areas, a working committee that would have representatives on that that would represent the governors involved, the mayors involved, and one representative from the Federal Government that would provide the funds.

I would go slow in saying how you should do this. I would rather let nature take its course and let these things grow gradually and get a program that the first year would admittedly fall far short of what you hoped to do but would be able to engender solid support from the existing community.

Mr. LIPSCOMB. Mr. Chairman?

Mr. HOLIFIELD. Mr. Lipscomb?

Mr. LIPSCOMB. General, I am not quite clear on what you had in mind, and I would like to take the city from which I come, Los Angeles, and see if I understand you right. Do you mean that the Federal Government should have a planning expert right within our own city planning commission?

Mr. NELSON. Oh, no.

Mr. LIPSCOMB. What do you mean here?

Mr. NELSON. Los Angeles is a little bit different because it is entirely within the State. I would like to see Governor Knight designate 1 person who is his representative and Mayor Paulson designate 1 person and I would like to see perhaps the Federal civil defense agency designate 1 top flight person, that would constitute then an ad hoc committee and sit down and say the Federal Government wants to take an increased responsibility for all the problems of nonmilitary defense as it affects the Los Angeles area, what are some of the things that we could do in which we could get complete agreement which if done would have these things.

First of all it would make Los Angeles less vulnerable to enemy attack and it would enable it to recover more rapidly if it had an enemy attack. And also if we did these things, it would prove to be of decided peacetime value to Los Angeles.

Mr. LIPSCOMB. What things are we talking about? I got a little off the subject. I thought you were talking about planning these suburban communities. I thought that was what you were putting your stress on.

Mr. NELSON. Oh, no.

Mr. LIPSCOMB. What things are you talking about?

Mr. NELSON. I am not as informed on Los Angeles as I perhaps should be.

Mr. LIPSCOMB. Take any city.

Mr. NELSON. I know you have a smog problem because I have listened to Governor Knight talk about it.

Mr. LIPSCOMB. You are hitting on a touchy subject now. You better take the aspects of salt water conversion or something like that.

Mr. NELSON. In many aspects of your smog problem it would measure quite closely with some of the programs of civil defense. I would think that—and this is something I know very little about—I would think in the Los Angeles area there exists many opportunities to get a better interlacing of utility networks so there are less likely to be power failures that are distressing to large sections of the area and that this is not very expensive and could be done. I would guess at some time the Los Angeles area is going to have problems of water supply, and sewage disposal, that when they break down in terms of a disaster, will greatly affect the ability of the industrial area that Los Angeles supports to continue to function.

Mr. LIPSCOMB. I can't conceive taking Los Angeles as an example of any large metropolitan area not having that kind of planning today.

Mr. NELSON. Well, maybe they have it in Los Angeles. The areas that I am familiar with, they don't have very much.

Mr. LIPSCOMB. If they don't, the local community should take the initiative to do that. Where does the Federal Government fit into this picture with finances as you recommend?

Mr. NELSON. What I am saying is—let me go back just a little bit. With the H-bomb, it is no longer a problem that can be handled within the confines of the smallest political subdivision, because it is greater than they can handle, so it would seem to me that you need now as your organization for disaster relief something that has pretty widespread ties with all the communities that are in the area.

I am familiar with some of the work that has been done in California and I think California has been one of the more progressive States in terms of getting the kind of organization between police chiefs, between fire chiefs, all this has been up until now pretty largely informal.

I would like to see it made the subject of a workable plan.

Mr. LIPSCOMB. We in California have a civilian defense director. We, as a State, this year have a budget of over $900,000 on this subject. They are continually making it more efficient and workable. I don't say that it is perfect, but I don't think it is money down the drain as of today. And the police chiefs, granted, meet with the highway patrol. They have a system of communications throughout the State, both radio and telephone. They have the air raid warning systems. So I mean they have such an organization now, admitting that it might not be as effective or as efficient as we would all like to see it.

Mr. NELSON. I wouldn't take exception to what you are saying. California along with New York has done a great deal in this field. They are much further ahead than a great many of our other areas. But one of the problems that exists in many States is that underneath the State civil defense director, there are thousands of communities with no very good intermediate organization. This is true I know of Pennsylvania. What I am suggesting, in using a metropolitan target zone is that by having the communities in the Los Angeles area have representatives that would sit down with the representatives from other places and in this case, the representative of the State and with someone in the Federal Government there to provide more direct information and closer liaison, they could work out what needs to be done for Los Angeles in a pattern that would be peculiarly suitable to Los Angeles. Because what will work in Los Angeles will not work in New York. I can't speak in too much detail on Los Angeles because I am not well informed on it. But it would seem to me by getting this kind of a committee working on the Los Angeles County problem that you could tie the various segments of the problem into a much better package, that you would be entitled to get much more Federal financial support than it is getting.

Mr. LIPSCOMB. That is why I raised my question. I was wondering what you had in mind.

I can see the leadership from a Federal level going in and sitting with them and trying to explain what the objectives were of civilian defense. But now where does the Federal financing come in in the city of Los Angeles?

Mr. NELSON. I would suggest that for the Los Angeles metropolitan target zone, which I am not trying to delineate——

Mr. LIPSCOMB. No.

Mr. NELSON. —I am saying that you would then make up a program, say for 1957 in terms of—this is what we want, this is what we think the organization should be, this is what we want to do, this is what we know it would cost. You would then get a greater sharing of that by the Federal Government than has been the case, because as I understand it in California, one of the great problems that exists now, they have done a great deal in this field, they are getting discouraged and there is great likelihood that the funds that have been available for this will not be available in the future.

Mr. LIPSCOMB. Specifically, with regard to the funds, you are talking about funds to run the organization and not for capital improvements or capital expenditures.

Mr. NELSON. I have been intentionally vague on this, because I don't think this is something that you can be glib about. I think this is something that you have to sit down and see what is it you think that you can do that is effective and needs to be done in a given year and then how should the costs in this be broken down. And this is something that I would hesitate to generalize on. I don't want to see the local people lose their local independence. I don't want to see the Federal Government come down and say we are taking over and we are going to run the show, because I don't think it can be done that way. I think it has to be done in an across-the-table fashion where you discuss problems and where you figure out how much of this ought to be borne by the local government.

Mr. LIPSCOMB. I was just a little interested in your comments about these parks and all the rest of the things, whether you expected in this allocation of funds that we would include such things as communities, sewers, streets and things of that sort.

Mr. NELSON. The reason I raised the subject of parks is that it seems to me that in some of the evacuation things that they talked about, there is not too much practicality of this talking about telling people to get out of their places and start walking out of town. This does not commend itself at least to my way of thinking as being a very commonsense thing to do.

I wouldn't do it myself unless I knew where I was going. I believe if you had reasonable facilities that would permit this kind of a thing to be done so that it is capable of being done and if you had areas that could be made usable on a basis that could have a going recreational value—if this could be off the record.

(Discussion off the record.)

Mr. HOLIFIELD. On the record.

Mr. Nelson, getting back to a practical approach in the city of Los Angeles and its environs, I would estimate that the target area in and around Los Angeles would include several counties and probably 60 cities, 50 or 60 cities.

There is at this time no master plan for that target area which has the approval of the military and the Federal Government. Wouldn't the first thing you would advocate would be that such an overall plan be established which would take into consideration the possibilities of evacuation, the necessity for shelter in case there isn't a successful evacuation possibility, would also take into consideration incentives for dispersal, for vital installations and vital industries, to less vulnerable parts of southern California or if necessary outside of southern California—and I recognize that this is a very touchy problem. But aren't those the things that ought to be settled first and could be settled by Federal leadership so that as we did in establishing the metropolitan water district of southern California, where we involved some 27 or 28 cities into a composite plan for obtaining water, we could also involve all the cities and counties within the metropolitan target area of Los Angeles in a well thought out, integrated and coordinated civil defense plan. Wouldn't that be the first step in that field?

Mr. NELSON. Yes. I would agree, except that this is something which in my opinion, you must do gradually over a period of time.

Mr. HOLIFIELD. I recognize that. You set up the plan. You may have a time schedule on the plan and it may take you 5 years or 10 years or 20 years to achieve your result.

Mr. NELSON. But I would not write the entire plan at the outset. What I think I am trying to say is this. That you get these people together and you agree on those things of a sometime future master plan that at that particular time is acceptable to the people and then as they work together over a period of time, then they can build on this. One of the great difficulties is that if you would try to tell the government representatives of any metropolitan target zone what they all ought to do immediately to put into effect a real acceptable overall plan, that you would have many of them that would balk. This being a democratic country, it would seem to me the way I would urge that you do this is that you would have them get together and be willing to say these are the things that we agree on and that we will do now.

Mr. HOLIFIELD. That is what I am talking about. For the Federal Government to take the leadership in bringing together the leaders of these communities and working out certainly not a rigid plan that could be imposed upon them from above by the Federal Government but working out a sensible plan which would take into consideration the problems of the complete metropolitan area, because I know that as long as it is left up to those individual cities in that area, each one going his own way and making his own plans without regard to the others, we are just not going to have a civilian defense in southern California.

Mr. NELSON. That's right.

Mr. HOLIFIELD. I recognize the difficulty. It is difficult to have a military defense in this age when you need supersonic planes and electronic devices capable of peering through the night and picking out objects. These are all very difficult too, but we are spending something like $35 billion a year doing that and we are only spending $86 million on the whole national civil-defense planning.

The question I am asking is—because I know we don't have a civilian defense which is anything except a hoax in the metropolitan area of Los Angeles, a complete hoax and it is admitted by any serious-minded, responsible civic official there—I have talked to a lot of them. And they are all in a quandary. They all admit they haven't got a civilian defense. So the point is you have to have some leadership and authoritative type of information and planning in order to evolve this type of a plan in that area. You have to start with first things first.

Mr. NELSON. That's right.

Mr. HOLIFIELD. I realize if we could use our great parks that we have in southern California not only for recreation but as location for shelter if we need shelter, that there should be a plan for that. And if we need additional facilities for recreation, there is no reason why they can't be used for Nike batteries and shelters.

There could be a community of interest locally from the standpoint of civilian defense.

Mr. NELSON. I think you are right, Mr. Chairman, in saying that it is only appropriate that the Federal Government be expected to take

the leadership in this. It is apropriate that the Federal Government should come up and say here are the elements that we think are important if we are going to put together a successful nonmilitary defense plan for a metropolitan target zone and I think the endeavor should be that after they spell out the various elements that form this thing, of which there are a great many and I did not mean to overemphasize the thing like parks and utilities. They just happened to come up as examples.

If this kind of material could be provided by the Federal Government, and I see no reason why it could not, as a working basis, as a working paper which you would sit down with representatives of the various governments involved in a metropolitan target area and say how much of this will you buy as of now for this year. I think you have to do it that way, because in some areas you run into very difficult problems.

For instance, when they consider the problem of evacuation of New York City, the first reaction of some of the civil-defense directors of some of the Westchester communities was that we are going to use our people to keep the people from New York out. This is the kind of a thing you can't say, you must do so-and-so.

I believe the program that is going to have to be adopted initially is one that meets with local approval. I was trying to be broader than just civil defense. I was trying to not only include civil-defense measures but there has been practically no accomplishment made in what I call the reduction of urban vulnerability or in industrial spacing. I certainly would not urge that the manufacturing facilities of any great city be taken bodily and moved far, far away. I think this is a completely unrealistic attitude.

Mr. BALWAN. To what exent, if I may interrupt, can industry take the initiative or exercise some leadership in this area?

Mr. NELSON. To get back to a metropolitan target-zone plan, if you could get an industrial facilities use map for the area, just so that business people could see it, could see where the various industries were located. Any time an industry wants to put down a new plant, this is the kind of information they need. At the present time it is quite expensive and difficult to try to get this kind of information. This information is not readily available.

Mr. BALWAN. Who should provide that?

Mr. NELSON. It would seem to me this is the kind of a thing that would come out of a metropolitan target-zone organization to provide some industrial use maps, some overall transportation and road facilities surveys, because it has been my impression that business and industry when they are looking for a location, there are certain things that they want, they like openness. They like road facilities. They like proximity to sewers and water and electricity.

If our Federal road and our State and city road programs could be coordinated so there would be some circumference highways built out around the periphery you would open up a great many new plant locations where industries when they expand and rebuild would seize upon that. You wouldn't have to say to somebody put your plants there. By doing a few things that are not very difficult or hard to do, you set the stage so all you would have to do is let the real-estate men go to work.

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Mr. BALWAN. To what exent can the insurance companies exercise leadership in this area?

Mr. NELSON. I don't think very much. Again you come down to the problem of Federal leadership. The great bulk of mortgage investments that are made by insurance companies are FHA insured mortgages and the attitude is if the Government says they are willing to insure the mortgage, the insurance company is willing to take it.

This has to be something that in all candor has to have some Federal leadership connected with it. The same way for tax amortization rates, business is normally anxious and willing to do what it can do profitably and it would not take too much work—it would not be too difficult then it would seem to me for the Federal and local people to get together on a means of rebuilding our cities, a means of permitting normal growth, normal expansion of industrial facilities in a way that would greatly reduce the vulnerability of our great metropolitan centers.

Mrs. GRIFFITHS. Mr. Chairman, may I ask a question?

Mr. HOLIFIELD. Yes.

Mrs. GRIFFITHS. You make it sound very simple.

Mr. NELSON. I don't mean to.

Mrs. GRIFFITHS. I don't think it is that simple. When you get these people together you will have to get the appropriate bodies. The moment it starts costing money, then you will have to have general assent from all these appropriating bodies that are affected and in order to have that assent, you are going to have to have general agreement among the taxpayers that this thing is necessary and that they are willing to foot the bill.

I can conceive of a situation even in this utility problem, who is going to pay for that? The rate payers? Are they or is the Federal Government or is the State government or is somebody else? If the rate payers are going to pay for them, are the great industrial users going to be willing to pay their share on it? Or are you going to put this back on the homeowner? If you are not going to put it on the homeowner and put it on the industrial users, then what are the political bodies that are appointed to make rates going to do? And what will happen at the next election after those rates go up? I think that you just have to have general acceptance of whatever kind of plan it is the moment it costs money.

Mr. NELSON. I certainly agree.

Mrs. GRIFFITHS. Then I think you have to teach everybody the whole thing. I think you have to let them all in on the plan and help them to see that this is essential.

Mr. NELSON. This is exactly what I though I was suggesting by saying that if you could have a metropolitan target zone, nonmilitary defense plan for say 1957, and initially you might have to make it extremely fragmentary, then you begin to get public acceptance and in 1958 you can go a little bit further and in 1959 you could go a little bit further. I believe the things that you can do that are needed for nonmilitary defense would be acceptable locally because they provide so many peacetime benefits.

Mr. HOLIFIELD. Mr. Nelson, on page 8 you urge that the principles set forth in the original report of Project East River and in the 1955 Review of the Report be followed; would you care to comment on those four principles at this time?

Mr. NELSON. I think I have talked about some of them. Certainly the leadership must come from the Federal Government and they have the primary responsibility. I think that the Federal Government must finance a large part of the program.

Mr. BALWAN. May I ask a question at this point? You say the leadership must come from the Federal Government. Our problem is as a committee to determine whether legislation is necessary to provide that or is it merely a change in emphasis in the way the FCDA is operating now?

Mr. NELSON. Well, I would answer that question by saying that I think Mr. Holifield's proposal for a real reorganization of the Federal Civil Defense Administration and possibly the Office of Defense Mobilization would be very useful because in effect it would permit a new start to be made and I think a new start does need to be made.

Mr. BALWAN. That is a reorganization plan which gives more stature to the organization rather than to attack the organic act itself. The question I asked is, Should we aim at modifying or recasting the organic act or is it something than can be done purely by reorganization, reshuffling, placing in a different place in the hierarchy of the Government?

Mr. NELSON. I think the honest answer I would have to give you is that I am not sure I know.

Mr. HOLIFIELD. The organic act places the primary responsibility upon the States, counties, and cities for civil defense. If we assume primary responsibility as meaning almost total responsibility for planning and financing, it seems to me that your testimony today would indicate that at least the major part of the planning and a strong part of the financing emphasis should be placed on the Federal Government.

Mr. NELSON. To try to give a better answer, I would say that I certainly concur. What I think I am advocating is this. That you need to reorganize FCDA really to give them increased stature, and to enable them to make a new start which I think would be useful.

Mr. HOLIFIELD. Do you think their work is important enough to justify Cabinet status?

Mr. NELSON. In my opinion, yes. As to the change in legislation, here is what I believe I am trying to say, that if you would try to write in legislation all the things that are needed, I would doubt whether you could get acceptance of them in the absence of a more effective program. It is the old chicken and the egg story, really. If FCDA and ODM could make considerable progress after having been given increased stature and make a new start, then it would seem to me that as they begin to make progress and as the people of the country feel at least we are getting on the right track, then I believe the time would be appropriate for some change in legislation, but I would think that if you try all at once to get into, say, new legislation that would be, say, in full bloom immediately, you could not do this, because you could not get the local acceptance that is necessary. A great many of the local people are somewhat jealous, properly, of local prerogatives. There is some resentment of the extension of the Federal Government's activities down into the locality. This has to be done, it seems to me on a trial-and-error basis, because I would urge, in extending the financial aid of the Federal

Government that we not do anything that would tend to reduce the autonomy of our local agencies. That is why it seems to me there has to be some sitting down around the table by people who are reasonable and work out things that seem to be practicable though not as rapidly as you would like to do it.

Mr. BALWAN. By making the Administrator a Secretary without any change in the authority he has, might not make any difference. It might bring about a new face, if one wants to conceive of organization. The alternative is not one of complete recasting of legislation. Might it not be amended to the organic act which takes the emphasis from making civil defense wholly a local responsibility to one where it is both a Federal and local?

Mr. NELSON. Yes, I would agree to that.

Mr. BALWAN. That might be more acceptible to people if we modified the basic organic act very slightly and so as to give it a different emphasis so when you make the Administrator a Secretary, he has something to do that is more effective and with more responsibilities once he does achieve that status. I think that the committee has been thinking in terms of the limitations upon the administration with the present law that it has to work with.

There are some who say that even in the present status as Administrator they could do more if they had more authority in the law.

Mr. NELSON. I would certainly be in favor of extending the authority of the Administrator with the proviso that I would not want this to be interpreted in any way as relieving mayors and governors of some of the essential responsibility that is inherently theirs which I don't see how they could, even if they wanted to give it up, I don't see how they practically could.

Mr. BALWAN. You know in your work on Project East River, do you know of any people who have given any consideration to legislative aspects, that the subcommittee might talk with.

Mr. NELSON. This was not an area we tried to go into. We felt this was outside of our proper province, quite frankly. We felt if there was anything in any of our recommendations that had merit, that this might then be seized upon by people who wanted to have legislation prepared. We did not think of ourselves in any way as trying to suggest to Congress what they ought to do. We tried to rather limit our comments to substance.

Mr. BALWAN. Those are all the questions I have on the first principle which Mr. Nelson mentioned, namely, increased responsibility on the part of the Federal Government.

Mr. NELSON. If I might perhaps mention one other thing that I alluded to, but which I would like to emphasize. Perhaps there has been too much emphasis trying to make civil-defense operations appear to be like military operations. You can take troops out and train them and go through excerises that will be very useful to them as training for battle. But the problem is quite different, it seems to me in civil-defense activities for this reason, you go through maneuvers with troops with a fair degree of orderliness. You get satisfaction out of it and the troops involved get the feeling of increasing competence. Where you have widespread civil-defense exercises that involve participation by the individual citizen, you get quite different results. At best civil-defense exercises are disorderly. If we had

an atomic bomb, what happens to population is essentially a messy, disorderly thing at best, even if you were relatively successful in your civil-defense operations.

So to me there is some danger in having exercises in which individuals participate as say civil defense drills. I would not want to be taken too literally on this, but where this has been done, it is very apt to engender more apathy, because it is an uncomfortable, relatively inefficient performance which makes you feel a little silly and makes you feel that not very much has been accomplished. That is why it seemed to me after the individual citizen has been as well informed as the FCDA can inform him on what he himself can do, for himself and his family, that then the next great effort needs to be made not in having exercises in which there is widespread civilian participation. What you need is to have a number of exercises in which only the people who are part of the organization participate in. For that reason I would urge that greater attention probably be paid to many of the things that they are doing, the sounding, say, of sirens with no civilian participation, the participation by auxiliary policemen and firemen in particular things and the attempt to use normal things that occur as a test perhaps of the working organization.

To me this is a better way to work in this field than the way we too often have done in the past where we attempted to use the pattern of using the equivalent of military drills as civil defense exercises because I am afraid they don't help the cause any.

Mr. HOLIFIELD. I would like to ask you one or two questions for the record, Mr. Nelson. You believe that it is necessary that we do have an efficient nonmilitary defense?

Mr. NELSON. Yes, sir.

Mr. HOLIFIELD. Do you feel that it is an important segment of our overall national defense posture?

Mr. NELSON. I feel it is quite important and as the years go by it should be of increasing importance.

Mr. HOLIFIELD. Do you believe that we could have a military defense in this modern age which would preclude the possibility of a breakthrough by a first-class air power with nuclear weapons?

Mr. NELSON. My view is an uninformed one, but I do think that this is more than one can reasonably expect.

Mr. HOLIFIELD. Therefore the war of the future will be a different war as far as America is concerned from any of the wars in the past in that we will have to sustain the impact of these new weapons upon our urban centers?

Mr. NELSON. That is correct and more important I think we should be prepared to sustain them because to the extent that we are prepared to sustain them this can act as a very powerful deterrent to war.

Mr. HOLIFIELD. Do you believe that there is a possibility within the period of the next 8 to 10 years that guided missiles and intercontinental ballistic missiles will be a reality?

Mr. NELSON. From what little I know and from informed people in whose judgment I have great confidence say, certainly it would be unreasonable to expect that we will enjoy more than 5 or 6 years before there is a possibility of intercontinental ballistic missiles. I would say this, and this is something I would like to emphasize if I could. It would be a great calamity if the prospect of interconti-

nental missiles in 5 or 10 years can bet aken hold of as a justification for not moving in this nonmilitary defense field, I don't pretend to be a technical expert in any way, shape or form but from what little I do know about it, it is quite clear that the guided missile will only be one of a whole arsenal of weapons. It looks like it will be a rather expensive way to deliver a missile, that there will still be a great reliance on airborne delivery of atomic bombs and the use of submarines.

In other words guided missiles is not going to cause in my opinion any great revolution. It is going to be merely one more weapon in a family of weapons all of which are quite perilous to our people and our industries. And the things that we can do now are things which I believe ought to be done in view of the threat that we face now with a view of being able to change them when the day of the intercontinental missile comes.

Mr. HOLIFIELD. But if we can expect this in 5 or 6 years we can also expect a diminution of the warning time, can we not, down to less than 1 hour?

Mr. NELSON. That is correct.

Mr. HOLIFIELD. When that time arrives——

Mr. NELSON. Could I speak to that a little bit more?

Mr. HOLIFIELD. Yes, sir.

Mr. NELSON. Maybe I am unduly optimistic but it would seem to me that we should not be too concerned about the fact at the moment that you might have warning time of only 20 minutes with the intercontinental guided missiles because I think for normal operation purposes you could count on a much greater warning.

I have no classified military information at my disposal and I am merely speculating as an individual citizen. Certainly as the United States is better prepared as we are getting all along and as we have more and more weapons at our disposal, I can't believe that any intelligent enemy would try to launch an isolated surprise all-out attack solely against our great centers of industry and population. The dangers of doing it are so great that the war of the future is not apt to start in this manner. The war of the future in my opinion is most likely to come about in quite a different fashion. At the same time that there might be a strike against our great centers of industry and population by missiles, planes, submarine launched missiles, at the same time that occurs, it would seem to me that it would be fantastic if there would not be at the same time a much heavier strike against our military installations both in the United States and abroad. For this to be done, then I believe that with the kind of intelligence we are capable of developing in this country our country can well expect to have a fairly substantial warning.

Mr. BALWAN. This is strategic warning you are talking about?

Mr. NELSON. I believe as weapons advance, the possibility of strategic warning will be advanced and the area in which it would seem to me that we have great opportunities for progress in nonmilitary defense is the situation where we know international relations have deteriorated to a bad time, we know that things are likely to happen, what are some of the things we can do in a difficult situation preliminary to war which will greatly increase the likelihood of our industries and our population surviving?

Mr. HOLIFIELD. I was working up to that point by my questions and I was going to ask you in view of the difficulties that are involved in evacuation, not only the movement, emergency movement of millions of people, but the care, shelter and feeding of people away from their customary dwelling places, would you care to express any opinion as to the comparative value of basing our nonmilitary defense on a shelter program rather than an evacuation program?

Mr. NELSON. Well, if I could make one comment before coming to that. The other thing I wanted to include in the statement is that I gave my views as to what I think should be reasonably expected as a war of the future, in part to illustrate why military resources are even apt to be less available, because I can't conceive of an enemy that would not place his first emphasis in a surprise attack on military installations.

I am sure that this would be accompanied by an attack on industry and population, but no enemy in his right mind in my opinion would concentrate on this and not place major emphasis on destroying our military capabilities.

Now as to evacuation or shelter, I don't think you should talk about them as principles that are unalterable. It might be well for certain types of communities like Indianapolis that evacuation has great merit. And it might well be that certain communities like New York City, which by virtue of its geography evacuation is an exceedingly difficult thing.

Mr. HOLIFIELD. Or Los Angeles with a basin and a desert surrounding it with very few roads leading out.

Mr. NELSON. This is why I believe so strongly in working out for each metropolitan area the combination of measures that seem to suit its peculiar position best. I would think it would be very impractical to generalize to say that this applies universally.

Mr. HOLIFIELD. In other words every target area has its own problems of topography and ingress and egress roads and bridges and surrounding country which is available for shelter.

Mr. NELSON. It might be, for instance that in New York City perhaps the best type of evacuation that one could contemplate for New York City would be merely to provide the warning and give the many people who work in Manhattan and other areas a chance to make a reasonable effort to go home, because what this does, it scatters the population which is highly congested in the daytime.

I think the figures are that the daytime population of Manhattan is in excess of 3 million and the nighttime population is just about a million. Thus much can be done by permitting people who work there to go home. In my own particular case, I work in midtown Manhattan, I live 50 miles away to which I commute regularly back and forth. Certainly to me this would be the first step to take. Coming back to your question, the kind of thing that would be the most positive and useful thing to do in Manhattan would be for your nonmilitary defense plan to concentrate on what are some of the things that could be done to increase the efficiency of the commuting systems that serve New York, that give them additional capacity. In the case of Detroit where so many people depend on the automobile for going back and forth to work, it would seem to me that there the

planning should concentrate on what are some of the things that could be done to help in, say, the road system.

Mr. HOLIFIELD. Have you considered the possibility of martial law being declared and if such martial law is declared suddenly as it was in Operation Alert, does this not indicate that there is this responsibility placed upon the military whether they want it or are equipped to handle it or not?

Mr. NELSON. I think a proper answer for me on that is to give you an answer that probably is not very satisfactory. I have been anxious that the people of the country understand that they must not place reliance on the military to bail them out in a period of atomic disaster, because the military will be fully engaged in handling their own problems.

Mr. HOLIFIELD. The full burden of the Chiefs of Staff's testimony bears you out in that.

Mr. NELSON. On the other hand, it seems to me that there is no doubt that if we do have an atomic disaster that to the extent that the military can, they ought to help, but I would like to see the military resources used in what I would term military aid to the civil power. I think it is unfair to the military to place a responsibility on their shoulder. The responsibility for doing the job must be elsewhere, with the understanding that the military would give all aid possible to the extent that they have troops and resources available.

The danger of talking about—the invoking of martial law—is that this is a very convenient tool for the average indifferent civilian. It is nice to be able to think Oh, well, I don't need to worry too much about this. If the going really get rough, the military will take over and this is what is going to happen anyway. It seems to me that the likelihood of this is so great that the military have to do some planning about it. But in the sense that they do plan about it and make it known generally, then it greatly handicaps any nonmilitary organization from becoming very effective.

Mr. HOLIFIELD. In view of the fact that the President has ordered a study on this subject, do you believe that it would be important for the American people and the Defense Department as well to know just exactly what is contemplated and to what extent and what type of martial law would be declared, if it is declared?

Mr. NELSON. Well, I think it would be desirable but it seems to me it is most unlikely that such a thing would ever be done, if the military would do this I think they might feel that it was perfectly appropriate to consider this as classified information which could not be made regularly available.

Mr. HOLIFIELD. The testimony of the military departments before us is that they do not want this responsibility and that they are not equipped to handle it, that they believe that a civilian organization should be built up to do the job, they will of course give all the help that they can give which they can spare from their primary mission, which is military action.

Mr. NELSON. I think this is very proper, a very proper attitude on the part of the military.

Mr. HOLIFIELD. Are you aware of the passage of Public Law 364 by the Congress which sought to encourage the setting up of State civil defense forces something on the nature of the Home Guard of England?

Mr. NELSON. I am slightly familiar. I understand some four States have taken advantage of that. I think I should say that any opinion that I give on this is probably a pretty uneducated and unintelligent opinion. But I have been more in favor of trying to strengthen say the police, the fire department, the State police, the welfare agencies by giving them auxiliaries than by making this a sort of a military operation.

I felt that this was not the kind of treatment that was called for that really the work could be better done, you would get more cooperation, you would get more of a feeling of responsibility if you built up organizations at the local, county and State level rather than putting up a separate and distinct organization which would seem to me that no matter how good they might be they would still be terribly inadequate to handle the problem.

Mr. HOLIFIELD. Your thought on that would be to create auxiliary police, auxiliary firemen, auxiliary sheriff personnel and fire department personnel and depend upon them to do the job under certain conditions of military attack?

Mr. NELSON. This would be my preference, although I certainly would not want to say that the other way could not be a very useful way of handling that.

Mr. HOLIFIELD. Mr. Lipscomb?

Mr. LIPSCOMB. No questions.

Mr. HOLIFIELD. Any questions, Mr. Kilgore?

Mr. KILGORE. No questions.

Mr. BALWAN. I just have one. In the East River Review Report, you have this paragraph that we mentioned to the military departments, with which they did not agree. You say:

> One of the present handicaps to coordinated planning and action is that each component of the Armed Forces has its own disaster plans. The Army has its own disaster plans for each of the Army areas into which the United States is divided; the Air Force and the Navy have civil plans, but they are integrated with the Army plans. All are classified with the result that State and local civil-defense directors have little or no knowledge of the details. Widespread public knowledge that each of the Armed Forces has such disaster plans has encouraged many citizens and many local governmental officials to sit back and do nothing in the hope and belief that the military will take over in time of emergency.

You have explained your position of the danger of that type of thinking. The only thing I wanted to bring up was: Do you have some information which we were not able to get out of the Army that they have disaster plans and that they were classified? Looking into it, what plans they had which they would release were not classified, and in probing them to find out exactly what they would do or what their part in disaster work would be, they said they have none. Just don't count on anything from us.

I would say if it were true that they had disaster plans, they ought not to count on it, because it has that effect.

Mr. NELSON. I don't want to put myself in a position of criticizing military people.

Mr. BALWAN. My only question is that perhaps the East River people have some information to show that the military people have some disaster plans which we could not find. We really dug with the Chiefs of Staff.

Mr. NELSON. It is my impression, although I may be wrong, that the various Army areas do have disaster plans which may be more or less sketchy. I participated in a meeting that they had in Philadelphia when the new mayor, Mayor Dilworth, was made director of civil defense for Philadelphia. At that time they had a meeting of a great many people from the surrounding area at which meeting a captain of the Navy attended who was in charge of the Navy operations in that area. This question did come up because this was after our 1955 review had been published. This particular Navy captain said they were in the process of revising their plan. We may be in an argument over semantics. I know in times past corps areas, which in my day were in organizations, did have as a regular part of their planning activities what could very well be labeled as a disaster plan.

Mr. BALWAN. We called in everybody from the Army Chiefs of Staff's office down to the Continental Army Command which was recently set up, to the Second Army commander, to the military district commander, to the base commander at Fort Meade, on one day including the civil defense director for the city of Washington here, and we certainly could not find any plan.

(Discussion off the record.)

Mr. BALWAN. That's all I have.

Mr. HOLIFIELD. That's all. Thank you very much, Mr. Nelson, for your testimony this morning. It has been very valuable to the committee and we appreciate the time you have given and the time you have taken to come here to give it to us.

Mr. NELSON. I hope it has been of some help. It has been a great pleasure.

Mr. HOLIFIELD. At this time, without objection, a statement of Richard M. Emberson, assistant to the president of Associated Universities, Inc., New York, will be accepted as an additional statement in today's testimony.

(The document referred to is as follows:)

STATEMENT OF RICHARD M. EMBERSON, ASSISTANT TO THE PRESIDENT OF ASSOCIATED UNIVERSITIES, INC., NEW YORK, N. Y.

I appreciate the opportunity given me by your invitation of December 20, 1955, to present my thoughts on civil defense in the United States. In summary, my conclusions and recommendations are as follows:

I. A decision must be made at the highest levels of the Government on whether the foreseeable risks warrant a comprehensive, nonmilitary, defense program to complement our military program. If a negative decision is made, many of the existing, halfway, civil-defense measures would have no other justification and should be abolished. If a positive decision is made, it must carry with it a determination to establish an adequate nonmilitary defense without delay, to provide genuine Federal leadership, and to provide the necessary support through both direct appropriations and indirectly through tax incentives and similar measures.

My personal opinion is that a comprehensive nonmilitary defense program is necessary. The next four conclusions and recommendations are based on this premise.

II. The nonmilitary defense responsibilities now residing in the Federal Civil Defense Administration and the Office of Defense Mobilization should be combined into a single unit, placed in the Executive Office of the President and responding directly to him, for the President alone has the necessary authority to weld the departments and independent agencies of Government into an effective and efficient defense effort.

III. Federal leadership must be given both through policy and plan and through example by every element of the Government.

IV. Direct support must be given through additional appropriations that may need to be as large as those that are now given to other defense programs. The Federal Government must carry the major burden for the formulation of policies and plans, both at the Federal and local levels, and for the proper implementation of those programs that can best be accomplished by the Government and not by the people themselves, singly or in small groups.

V. Indirect incentives must be given to the private citizen, groups, commerce, and industry to adopt measures that will supplement the activities of the Government. These private measures are an important part of the relatively long-range program to reduce our vulnerability to attack.

Before discussing the factors that have led me to the above recommendations, I will state for your record my past and present involvement in civil defense. For five years immediately after World War II, I was a member of the secretariat of the Research and Development Board, Department of Defense, from which vantage point I could observe the complete spectrum of military weapons and techniques that might be used in future warfare. In 1951, I joined Associated Universities, Inc., as the assistant to the president, which position I now hold. My first major task with AUI was with the project East River study of civil defense, which was under the direction of Gen. O. L. Nelson, Jr.; I was a full-time member of the project staff, and director of technical studies, and deputy director in its closing phases. Since the submission of the project East River reports in late 1952, I have been more or less continuously involved in civil defense, although not always on a full-time basis. In 1953–54 I served as an assistant to a special three-man committee on civil defense established by the Life Insurance Association of America: Mr. J. T. Phillips, chairman, Mr. G. D. Bleicken, and Mr. Samuel Milligan. In 1954–55 I served as a member of a study group established within the Government, which examined civil-defense problems, among others. Since its formation in 1954, I have been a member of the Advisory Committee on Civil Defense of the National Academy of Sciences. In 1955, I served as a member of the group organized by General Nelson, on the invitation of the Director of the Office of Defense Mobilization, the Secretary of Defense, and the Administrator of the FCDA, to review and advise on the original project East River report in the light of subsequent developments. For your record, I would like to note that AUI receives support from the Atomic Energy Commission and the National Science Foundation, but I, an employee of AUI, am not speaking for nor necessarily representing the views of these agencies, nor, for that matter, do I speak for AUI. The comments that follow are solely my own, representing the thoughts of an individual citizen and taxpayer who has had opportunity to become acquainted with some of the problems of civil defense.

If the preceding paragraph implies that there are among us experts who know all the answers about civil defense, this misconception must be corrected at once. Generally, one may say that much of the World War II bombing experience is not directly applicable to present and future problems of civil defense because of the great dissimilarity between World War II carriers and weapons and those of the foreseeable future, e. g., slow airplanes and chemical munitions compared to intercontinental jet bombers or missiles and nuclear munitions. Even the two atomic bombs used in the closing days of the Pacific phase of World War II did not produce information that is now of great value for several reasons, among which are: (*a*) The early atomic bombs were a tremendous increase over prior munitions but are smaller, by almost the same factor, than present capabilities; (*b*) the physical structure of urban and industrial complexes in the United States is quite different than that in Japan; and (*c*) the individual and mass psychological and social patterns of United States citizens are different in many respects from those found in other countries. Although the several series of weapons' tests conducted at the Pacific Proving Ground and in Nevada have given much information needed for the weapons development programs and for other purposes I believe no well-informed person would assert that a thoroughly validated understanding of the civil-defense aspects has been provided. Finally, it should be noted that natural disasters, however extensive they may be, simulate and test only a few of the components that would likely comprise a national war disaster. Thus an expert on civil defense in the United States—speaking on the basis of prior experiences and direct personal observation—does not exist. We are forced to extrapolate far into the unknown, and expertness on specific items is necessarily mixed with a certain amount of prophecy. To engage in prophecy is hazardous. People do not like to have established patterns

disturbed and hence resent a prophet of doom, crying that all may be lost if new measures are not adopted. If wrong, the prophet will be regarded as a crank or a fool; if right, even in part, he may become very unpopular and perhaps be subjected to attack.

There can be no doubt that we now live in an era of war technology quite different from that of World War II. The point has been made repeatedly, in the original Project East River report and elsewhere and most recently in the review of the report of Project East River, that a proper defense today must have three strong components: Military forces for defense, including retaliation; economic and social patterns designed to minimize our vulnerability to attack and to maximize our ability to carry on after an attack; and preparations to cope with the emergency situation immediately before, during, and after an enemy attack. For obvious reasons, the last two components are usually called the nonmilitary defenses. With the advent of multimegaton nuclear weapons, the line separating these components has, in may opinion, faded or sometimes disappeared, and civil defense has become an interwoven part of the total defense.

Before commenting on our nonmilitary or civil defense, its organization, and financing, it is first necessary to consider the question: Do we need any and if so, how much? I think it is fair to say that a typical study group, informed of modern weapons and weapons effects, will build its findings and recommendations on the premise that civil defense is necessary. This has always been my view. But it is by no means clear that the United States public and its Government hold this view. True, lip service is given to civil defense from time to time, but there is conspicuously absent a genuine Federal leadership, demonstrating by action in every element of the Government, that civil defense is a high priority objective. If civil defense is needed, the United States could afford to put as much again toward civil defense as is devoted to military objectives. But one needs only to examine recent budgets submitted to the Congress and the subsequent congressional appropriations to see that this is not so. Finally, let us look at the attitudes and actions of private individuals and groups, where the examples of civil defense awareness are few indeed. In the final analysis, it is the attitude of the general public that truly reflects the effective policy, as distinguished from our oratorical policy, on civil defense. From my office window in New York, I see a scene that is repeated again and again across the country. Squat old buildings are demolished and are replaced by new structures of far greater capacity and value. What do these property owners, developers, and builders think of civil defense? Certainly they must read newspapers and current journals. Certainly they have heard, or later read, speeches on civil defense by high public officials. In some cases, these owners and builders are men who have themselves held high and trusted positions in our Government. It cannot be that they so soon have forgotten what they learned as officials. It appears, rather, that we, the public, are gambling on the prospects of an all-out war. We do not know what the odds are, but we hopefully expect them to be large and in our favor. We realize that new construction will increase the density of population per square mile, will increase the physical value of an area, and will increase the attractiveness of that area as a military target. Our very actions change the odds of the gamble, but we proceed, silently hoping that other factors, unknown and thus not easily controlled, will hold the odds or even keep them steadily increasing in our favor. On the other hand, it is neither right nor proper that these men be severely criticized as individuals. They may realize the serious need for civil defense. But can they commit their companies singly to a program that is better, but also more costly? If they should embark on such a course, their companies would be at a competitive disadvantage by just this extra cost, which course seems to lead more certainly to collapse and ruin than the unknown odds in the war gamble.

The public is accustomed to the need for strong military forces and each year pays taxes to support them. Can it be that the public is still so uninformed that it fails to recognize the need for civil defense? Or has the public properly evaluated the need and concluded that the great burden, year after year, for a really adequate civil defense is not justified? It seems to me that the most imperative requirement today is for a decision on whether we need a civil defense and, if so, how much. I hope your committee will bring us closer to this decision.

I personally believe that a civil defense is needed—a far more vigorous and comprehensive effort than anything we have had to date. The comments that follow are based on this premise.

The United States is not an aggressive nation. Hence, all our efforts and preparations are built around a philosophy of peace, with defense if necessary. This defense has grown increasingly more complex year by year. No one will argue with the concept that a part of our defense must be a military ability to carry the fight back to the enemy by land, by sea, and by air. No one will argue that strong defensive military capabilities are necessary. But it is a relatively new and not so well-understood concept that nonmilitary defenses have important roles too. There are the usual activities grouped under civil defense—public warnings, evacuation and shelters, emergency housing and feeding, and medical care. Measures to counter radioactive fallout are entirely new in the experience of humanity. There are other programs of equal importance—the reduction of urban vulnerability and preparations to facilitate a postattack recovery, including measures to insure the continuity of our republican form of government.

Your comittee has before it two bills, House Joint Resolution 98 and House Concurrent Resolution 108, that are concerned with the organization for civil defense at the Federal level of Government. For a long time I have held the opinion that the organization for civil defense may be a controlling factor in the success or failure of the effort. I hold this opinion because it can be demonstrated in laboratory experiments that certain types of simple problems that require contributions from several individuals or groups for solution can be solved only with great difficulty, or not at all, in the absence of an adequate and proper organization. Civil defense is not a simple problem. It is highly complex and if we are ever called on for a maximum solution, in a national wartime disaster we will fail miserably if we lack a proper organization. I do not believe that the existing organization is adequate; hence it follows that some revisions must be made.

I do not believe that all of our defense—the familiar military role and the newer civil or nonmilitary defense—should be brought within the Department of Defense, as proposed in House Concurrent Resolution 108. If that were done, the Secretary of Defense, an appointive rather than elected official, would supercede the President in the control of the United States during a war disaster. This is true because the total defense involves every citizen and every activity in the country. This organizational arrangement would have the further disadvantage of pitting the embryonic nonmilitary efforts against the well-established military branches, which are backed by years of tradition, by large permanent professional corps, and by strong industrial groups who are involved in the multibillion dollar contract programs for military weapons and equipment.

Neither do I believe that an adequate organizational solution is obtained by transforming the present Federal Civil Defense Administration into a new executive department. The weakness in this solution is that the new department would be expected to exercise an authority over all the other departments, including the Department of Defense, particularly in the event of a war disaster. It seems unreasonable to expect anyone less than the President to exercise such authority.

It is my view that the defense responsibilities now divided between the FCDA and the Office of Defense Mobilization should be combined in a single unit, placed in the Executive Office of the President. Policies and plans would be promulgated with the backing of the Presidential authority; the implementation of these plans and policies would likewise carry his authority, whether accomplished directly or by delegation to some other agency or department of the Government. Differences of opinion within or between the departments would come back for resolution at the Presidential level, as they properly should.

Much has already been written on the various measures that must be taken to provide an adequate defense. I agree particularly with those given in the Project East River reports. I am distressed by the implementation given to these proposals. The need to close the gap between the Federal Government and activities at local levels is becoming increasingly apparent. For example, current metropolitan area studies (New York Herald Tribune, Dec. 30, 1955) are "aimed at drafting plans for emergency evacuation" rather than being properly aimed at studying whether any foreseeable combination of preattack circumstances would make feasible an evacuation. Similarly, if the United States were ever subjected to a major attack a veritable cross section of our economy should be dispersed and thus highly invulnerable in order that we might better survive and recover. Yet the measures so far taken by the Federal Government have been highly selective in favor only of continued military production. The first task of the Federal nonmilitary defense agency should be a prompt review of

plans and policies, to be followed by implementation throughout the Government, thus providing the leadership in civil defense matters that to date has been lacking.

An adequate defense will be costly, compared to our efforts in the last decade. Yet I am convinced that we can afford the necessary support. Part must be in the form of congressional appropriations, which for several years may need to be as large as the total for all other Government activities. The long-range reduction of vulnerability will require private efforts in addition to those of the Government. These private efforts will not be made unless there are proper incentives. Patriotism is a strong incentive after we become involved in war. But that would be too late to accomplish a worthwhile reduction of vulnerability. Hence it seems necessary to provide some form of dollar incentive (through an appropriate tax system or otherwise) if progress is to be made under present conditions.

I hope that my comments will be helpful to your committee and I will be glad to give any further assistance that you might desire.

Mr. HOLIFIELD. Also, the 1955 Review of the Report of Project East River will be received for printing, in view of the fact that our witness today, Gen. Otto L. Nelson was also Chairman of this Board and it has been referred to several times in the testimony.

The committee stands adjourned.

(Whereupon at 12:25 p. m. the hearing was adjourned.)

(The document referred to is as follows:)

1955 REVIEW OF THE REPORT OF PROJECT EAST RIVER

OCTOBER 17, 1955.

The Honorable VAL PETERSON,
Administrator, Federal Civil Defense Administration.
The Honorable ARTHUR S. FLEMMING,
Director, Office of Defense Mobilization.
The Honorable CHARLES E. WILSON,
The Secretary of Defense.

DEAR SIRS: As requested, there is submitted herewith a 1955 Review of the Project East River Report submitted in 1952.

In this 1955 review, a substantial effort has been made to suggest what are believed to be some practical machinery and techniques to facilitate the implementation of recommended policies and procedures, and to develop additional poicies as progress is made.

As might be expected in this complex field, the committee has not found it easy to agree in detail. It is believed that we do agree substantially in principle and that there are only minor differences of opinion on details. For the views expressed in the attached report, the chairman takes complete responsibility; the other members, it is fair to say, bear some lesser responsibility in that the report in some items goes further or does not go as far as certain individual members would have wished. If this necessary give-and-take on the part of the individual members is recognized, it is believed that the report reflects fairly the general views of all committee members.

The committee has enjoyed the cooperation and advice of representatives of the Departent of Defense, the Federal Civil Defense Administration, and the Office of Defense Mobilization. Many of the suggestions in this report have come from Government personnel. In the early stages of our deliberations we were briefed on plans and policies and on technical developments since the completion of project East River. We are particularly grateful for individual criticisms and discussion of specific portions of the report as they were being drafted. We feel that the report reflects this help, and our thanks are due to all who assisted with the work.

It is hoped that this report will be helpful.

Sincerely,

Otto L. Nelson, Jr., Chariman, 1955 Review Committee; Richard M. Emberson, Joseph E. McLean, Stephen F. Voorhees, J. B. Horner Kuper, Burnham Kelly, Perry Bugbee, Elihu Root, Jr., Marlene Morrisey, Lloyd V. Berkner, Leland J. Haworth, Albert G. Hill, Katherine G. Howard, Horatio Bond.

EXECUTIVE OFFICE OF THE PRESIDENT,
OFFICE OF DEFENSE MOBILIZATION,
Washington, D. C., May 4, 1955.

Gen. OTTO NELSON,
Vice President, New York Life Insurance Co.,
New York, N. Y.

DEAR GENERAL NELSON: Secretary Wilson, of the Department of Defense, Governor Peterson, of the Federal Civil Defense Administration, and I join in inviting you to chair a committee to review Project East River recommendations, in the light of present developments.

For instance, our existing dispersion policy of 10 miles from the perimeter of the target area is obsolete under the new weapons conditions. There are other serious hazards caused by fallout which need consideration. Most of all we need the thinking of those of you who are away from the day-to-day activities of Federal Government, but who are still thoroughly concerned with the basic problems.

Our informal telephone conversations in which you agreed to serve as chairman are finalized in this letter, and the first meeting will be in room 100 of the Executive Office Building, at 10 a. m., on May 9. I have asked General Paul to work out the details and provide you with such information as you need.

I am deeply grateful for your willingness to add this public service to your already long list of accomplishments in this field.

Sincerely yours,

ARTHUR S. FLEMMING, *Director.*

1955 REVIEW COMMITTEE OF THE REPORT OF PROJECT EAST RIVER

Gen. Otto L. Nelson, Jr., chairman, vice president in charge of housing, New York Life Insurance Co., 51 Madison Avenue, New York, N. Y.
Dr. Lloyd V. Berkner, president, Associated Universities, Inc., 350 Fifth Avenue, New York, N. Y.
Mr. Horatio Bond, chief engineer, National Fire Protection Association, 60 Batterymarch Street, Boston, Mass.
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Dr. Leland J. Haworth, Director, Brookhaven National Laboratory, Upton, Long Island, N. Y.
Dr. Albert Gordon Hill, professor of physics, Massachusetts Institute of Technology, Cambridge, Mass.
Mrs. Katherine G. Howard, 124 Beacon Street, Boston, Mass.
Mr. Burnham Kelly, associate professor of city planning, Massachusetts Institute of Technology, Cambridge, Mass.
Dr. J. B. H. Kuper, Chairman, Instrumentation and Health Physics, Brookhaven National Laboratory, Upton, Long Island, N. Y.
Hon. Joseph E. McLean, commissioner of conservation and economic development, State of New Jersey, Trenton, N. J.
Mrs. Marlene D. Morrisey, Administrative Assistant to the Librarian of Congress, Library of Congress, Washington, D. C.
Mr. Elihu Root, Jr., 52 Wall Street, New York, N. Y.
Mr. Stephen F. Voorhees, Voorhees, Walker, Smith & Smith, 101 Park Avenue, New York, N. Y.

INTRODUCTION

In May 1955, at the request of the Secretary of Defense, the Director of the Office of Defense Mobilization, and the Administrator of the Federal Civil Defense Administration, a group composed largely of former participants in Project East River was assembled to reappraise, in the light of conditions existing in the spring and summer of 1955, the recommendations contained in the Report of Project East River which was submitted in October 1952.

Under the circumstances, a detailed review of the Project East River Report was not feasible. This then is a report which seeks to point out only the more important developments and changes which have occurred in the last 3 years and to recommend those policies and programs that seem to be of most urgency

in adjusting to present-day changes and that need to be taken as essential first steps before other improvements or changes can be assimilated. Already a start has been made on many of the suggestions contained in this report.

During the last 3 years, very commendable progress has been made in certain areas by the Department of Defense, the Federal Civil Defense Administration, and the Office of Defense Mobilization in implementing and in improving upon many of the suggestions made by Project East River. The Department of Defense has made significant progress in establishing an effective continental defense system, even though certain important elements of the new continetal defense system will not be completed for several years. The Federal Civil Defense Administration, in spite of many difficulties, has also progressed, notably in the areas of warning and communications, in stockpiling of medical supplies, and in arranging such test exercises as Operation Alert. Because of understandable difficulties. the Office of Defense Mobilization, assisted by other Federal agencies, particularly the Departments of Commerce and of Defense, has been able to make only limited progress in the decentralization of new industrial construction under the tax amortization program. If there has been a net reduction in urban vulnerability, it has been very small.

In our opinion, a very substantial part of the contents of the Project East River Report is still valid. There have been, of course, substantial advances or changes in weapons, the methods of delivery, the international situation, and in public attitudes. All this requires some change in emphasis and some modifications in the application of principles and procedures enumerated in the Report of Project East River.

Despite the efforts made, it is necessary to report that the Nation's preparations and progress in nonmilitary defense are still far from what they should be. That this is so is largely attributable to three conditions. First, the rate of advance in weapons and delivery systems has greatly exceeded the rate of progress in our nonmilitary defenses. Thus, while progress has been made in both areas, relatively speaking, the gap between the threat and the nonmilitary defenses has widened. Second, man generally seems to be mode adept in making technical and scientific advances than in making the social and other adjustments necessary to cope with such material progress. Third, in view of this handicap, there has been lip service but not the positive leadership needed in the field of nonmilitary defense.

This report consists of two parts: first, a discussion of recent developments in weapons and weapons delivery systems and changes that have either taken place or are now better understood in the international situation and in national attitudes—in short, the underlying conditions dictating either modification or change of some of the Project East River conclusions and recommendations; second, a statement of conclusions and recommendations that result from our reconsideration and review of the problems of nonmilitary defense in the light of the developments of the past 3 years.

PART 1. SIGNIFICANT DEVELOPMENTS AND CHANGING CIRCUMSTANCES

The following significant developments and changes over the past few years are stated as a preliminary to our conclusions and recommendations.

1. The development of much more powerful and less expensive weapons by this country and its potential enemies has progressed very rapidly and very substantially. Until a few years ago, atomic bombs were thought of in terms of kilotons, i. e., thousands of tons of TNT destructive power. Now it is clear that megatons, i. e., millions of tons of TNT destructive power, are the appropriate units. An authoritative yet unclassified description of the progress in developing megaton bombs can be found in the speech of Dr. Willard F. Libby, Atomic Energy Commissioner, given at Chicago, Ill., on June 3, 1955. A summary as reported in the New York Times of June 12, 1955, is included as exhibit 1.[1]

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[1] For additional data, please see:

1. The Effects of High-Yield Nuclear Explosions, statement by Lewis L. Strauss, Chairman, and a report by the United States Atomic Energy Commission, February 1955 (Superintendent of Documents, U. S. Government Printing Office, Washington 25, D. C., price 10 cents, or reprinted in the 18th Semiannual Report of the Atomic Energy Commission).

2. FCDA Technical Bulletin TB–8–1, February 1955, Blast Damage From Nuclear Weapons of Larger Sizes (Superintendent of Documents, U. S. Government Printing Office, Washington 25, D. C., price 5 cents).

Dr. Libby's statement pays particular attention to the virtually unlimited size, low cost, and large fallout of the most recent nuclear weapons.

It is plain that nonmilitary defenses planning, policies, and operational procedures must be revised to take into account adequately this transition from the atomic bomb of the past, the nominal size of which was rated at 20,000 tons of TNT destructive power, to the multimegaton bomb of the present, rated as high as 20 million tons of TNT destructive power, to the perhaps larger bomb of the future, rated at 50 million tons of TNT destructive power—or even more—with the size being limited principally by the capacity of the delivery system. The time is close at hand when the United States and its potential enemy will have these weapons in quantity and also greatly increased carrier capabilities, in terms of speed and load, so as to pose the threat of annihilation.

2. The fallout of radioactive material has now become a much more serious problem. With nuclear weapons becoming so much more powerful and less expensive to produce and with the likelihood that these might be detonated at near-ground level, nuclear warfare would bring about a manifold increase of radioactive dust in the atmosphere, resulting in potentially lethal fallout over thousands of square miles. This is a development which not only greatly complicates civil-defense measures but also requires special countermeasures.

3. The intercontinental ballistic missile is very likely to become a reality in 6 to 10 years and possibly much sooner. There appears to be no sound scientific or practical reason for assuming any other conclusion. In this connection a word of caution is believed to be necessary because of the claim that is sometimes made that there can be no defense against this so-called ultimate weapon. The development of missiles for offensive purposes should bring as a by-product some progress in the design and effectiveness of missiles for defense purposes. At any event, missiles are not likely to replace completely the manned long-range bomber or sea vessels as the carrier of nuclear weapons; intercontinental missiles or shorter range missiles launched at sea will merely be additional methods of delivery. However, nonmilitary defense planning must take the contingency of the early development of long-range missiles into consideration in the development of future policies and operational procedures. In this connection, there is the special problem that the possible warning time for the intercontinental ballistic missile cannot be expected to be more than from 10 to 20 minutes.

4. Another significant development has been the very considerable improvement in continental air defense. This is heartening because it establishes conditions precedent to and essential for the development of an effective nonmilitary defense program. It is believed that this country has now reached the stage where a 1- to 2-hour early warning against enemy-manned, long-range bombers can be regarded as an average anticipated warning time for purposes of planning a civil-defense program and conducting training exercises. Scheduled improvements and extensions of our early warning system would further increase this probable warning time were it not for the circumstances that these gains will be offset by continuing increases in plane performance, both as to speed and load-carrying capacity. It is reasonable to assume now and for the immediate future that an early warning of from 1 to 2 hours can be taken as normal or average for enemy-manned bombers. It is necessary, however, to prepare also in the near future for the contingency of an early warning of from 10 to 20 minutes against missiles.

5. During the period 1952–55, it has become increasingly evident that a serious gap exists in Federal-State-local relationships in the field of nonmilitary defense. City and State officials, and indeed the average citizen, believe that nonmilitary defense is a part of national defense and that at the present time the Federal Government is shirking its responsibility in this field. The attitude of Federal officials is that in large part there must be reliance on State and local machinery and personnel; there is no other practicable method. Both of these views are believed to be sound, and so some additional means are needed to make local and Federal efforts complement and supplement each other more effectively. There must be an end to the present habit of presumably responsible officials at local, State, and Federal levels attempting to shift responsibility to others instead of determining who is responsible for what.

6. The most important consequence of the rapid progress in making much more powerful and cheaper nuclear weapons and the resulting increasingly serious problem of radioactive fallout is that the potential disaster area will be larger than any city boundary and will frequently overlap several State boundaries. Then the fallout pattern, resulting from bomb drops in other areas when added to local bomb drops, produces a very large area problem.

7. Worldwide trends over the period 1952–55 lead to certain general observations concerning nonmilitary defense problems. They involve not so much a change in the diagnosis of the problem as the necessity for added emphasis or perhaps restatement in slightly different form. Despite the lack of close relationships in some cases, they are nevertheless grouped together for convenience as follows:

(*a*) Comparing 1955 with 1952, the international situation does not seem to the public to be so precarious. In addition, our military offensive and continental defensive capabilities have so improved that they now exert a stronger deterrent against a surprise attack or an all-out war than was the case in 1952. While a ruthless enemy might attempt a surprise attack at any time, it is probable that international tensions may continue for many years without necessarily involving an outbreak of war. Whenever the likelihood of immediate war decreases, there is the added problem that public interest, congressional support, and adequate appropriations for nonmilitary defense are more difficult to obtain. Because of these trends, there is the requirement that the nonmilitary defense program must be able to cope with the existing threat and also evolve on a long-range basis, keeping abreast of changes and meriting public support and confidence. The present international climate is such that nonmilitary defense programs strengthen the potential for peace and can proceed without any charge of warmongering.

(*b*) The problem of general public apathy continues, and many recommendations on this subject were made in the 1952 report. The 1955 reappraisal forces the unpleasant observation that the general public is as disinterested in 1955 as in 1952 despite the public education program and other efforts of Federal, State, and local civil-defense agencies. Education of the public in civil defense has been complicated by the rapid development of more powerful weapons and weapons delivery systems. There are many qualified observers who deny vigorously that the public is apathetic. They claim that the average citizen is not apathetic but so thoroughly confused by the conflicting opinions and instructions of the various levels of authority and experts that he can only stand fast and do nothing in the face of uncertainty. Contributing to this uncertainty has been this rapid change in weapons effects which required changes in policy and in turn precipitated conflicting opinions on what changes should be made. Great skill and adeptness are needed in continually adjusting and testing the civil-defense program so that it meets the needs of each citizen and family in an explicit, sensible, and acceptable manner in the face of continuing progress in developing new nuclear weapons.

(*c*) In our opinion, there is another factor which not only affects nonmilitary defense substantially but which dictates that emphasis be given it in terms of nonmilitary defense policies and operational procedures. This is the circumstance that as the military and nonmilitary capabilities, both for the offense and defense, become more powerful and more effective on both sides, there is an increasing possibility that an enemy would place principal reliance on his ability to deliver an initial massive and decisive surprise attack against the continental United States, our Strategic Air Command bases abroad, and the forces of NATO and our other allies. This is not the only enemy capability to prepare against, but certainly it is of sufficient likelihood that effective countermeasures should be developed.

Detection of advance preparations for such an attack is clearly imperative. Fortunately, the required scale of the preparations increases their susceptibility to intelligence detection even though the indexes of more conventional mobilization may be lacking. It is thus feasible as well as necessary that the intelligence agencies of our Government place continuing emphasis on providing strategic warning against all-out strategic attack. It follows that four categories of warning should be recognized in developing appropriate nonmilitary defense policies and operational procedures. These categories, in order of the priority in terms of effort and attention that should be given them, are:

(1) Strategic warning given days in advance based on a deteriorating situation and enemy mobilization activities;

(2) Two hours or more warning based on detection of attacking aircraft by our distant early warning or overseas networks, or intelligence of enemy deployments;

(3) Emergency warning minutes before attack;

(4) No warning at all.

In addition, there are the possible variations of (2) and (3) above following the occurrence of (1) or coming intially without it. At any event, well-defined

policies and specific courses of action for each contingency need to be developed. It is especially appropriate in 1955 and in future planning to give added emphasis to civil-defense plans and procedures designed to take advantage of strategic early warning. Even in the case of no warning at all, sound advance planning and preparations can do much to prepare the public for a surprise attack and to reduce its possible effect.

8. In terms of what had been hoped for in the way of progress in carrying out our 1952 Project East River recommendations, it may be useful to state certain of our disappointments as of 1955. They can be listed as follows:

(*a*) While Project East River placed great stress and considerable emphasis on the reduction of urban vulnerability (Pt. II–B; Federal Leadership to Reduce Urban Vulnerability, and Pt. V: Reduction of Urban Vulnerability, it is disappointing to observe that such little progress has been made. It is fair to state that the political and economic obstacles to any such program were underestimated by Project East River.

(*b*) It had been hoped that the National Security Resources Board and its successor, the Office of Defense Mobilization, would gain better acceptance and would be more adequately recognized as striving to carry out effectively a most important function in the field of nonmilitary defense planning and preparations. The declining attention in terms of personnel, funds, and keyman interest in the problems of industrial dispersion, reduction of urban vulnerability, and post-attack rehabilitation is particularly disheartening. In the face of the development of weapons of more and more destructive power, this work would seem to be of increasingly greater importance, complexity, and difficulty.

(*c*) When Project East River was underway, it was generally realized that the Federal Civil Defense Administration was just getting started and that it needed time in which to develop and acquire competence and recognition. Perhaps it was expecting too much, but this committee finds it necessary to express its disappointment over the slow progress attained despite the valiant efforts of Federal Civil Defense Administration personnel. Undoubtedly, the move from Washington Battle Creek, Mich., with its consequent upheaval was responsible for some temporary paralysis in effectiveness. The character of much of the Federal Civil Defense Administration's work is such that day-to-day contact with many Federal agencies is required. The move away from Washington has crippled its effectiveness in this respect. It is believed that the Federal Civil Defense Administration does not yet have the stature, prestige, acceptance, or effectiveness with the Congress, with other governmental agencies on the local, State, and Federal level, or with the people of the country that it is so badly needs and should have. It is only fair to say that even under the most favorable circumstances, this is not easy to accomplish except over a very long period of time.

At this point it is appropriate to reiterate that the developments, changes, and observations described above do not pretend to be inclusive or complete but are listed to set the stage and be a preface to the conclusions and recommendations which follow.

PART 2. CONCLUSIONS AND RECOMMENDATIONS

The following conclusions and recommendations based on the developments and observations summarized above represent what are believed to be the most urgent, practical, and realistic steps that can and need to be taken. In some instances, solutions short of the ideal have been proposed in an attempt to recommend only actions that in our opinion are politically and economically feasible and not requiring drastic revisions of our laws or social patterns.

I. With high-yield, nuclear weapons, effective and practical nonmilitary defense requires that it be organized and operated on the basis of metropolitan target zones

A. Conclusion.—With megaton bombs, the old concept of self-help on a town or city basis becomes impractical. Since nuclear weapons of the type likely to be used devastate an area much larger than most cities, their impact on any metropolitan target zone is such as to require that an effective defense be planned and conducted on a metropolitan target zone basis. Anything less than this is inadequate and obsolete. Certainly, plans for evacuation and shelter protection will be inadequate and conflicting if not approached on that basis. Plans for industrial dispersion and reduction of urban vulnerability must be keyed into evacuation and shelter plans and, again, they will be meaningless unless developed on a metropolitan target-zone basis. Civil-defense operations in the face of nuclear weapons cannot very well be based on city,

town, or village self-help—they must be based on regional self-help. The principle of community self-help is still valid, but the region rather than the city must become the planning unit inasmuch as the area of anticipated destruction has widened so tremendously.

Undoubtedly, it would be desirable to define more specifically the term "metropolitan target zone." Our conclusion is that it would be a mistake to establish at this time a general set of specifications to be applied to each area. Such a general specification is, of course, needed but it can best be deduced from a number of specific cases that have been arrived at by local informed action taken without general restrictive limitations. Thus, it is believed that the only general statement that should be made before empirical data are obtained is that metropolitan target zones should initially be set to be only as large as needed to encompass a metropolitan area. Initially, the support areas to be included should be kept at a minimum size. The suggestion is to start on the small side, with the recognition that experience may dictate the inclusion of additional areas later.

B. Recommendation.—That the metropolitan target zone be utilized as a basic unit for nonmilitary defense planning and operations.

II. Federal civil-defense plans, policies, and operating procedures need to be continuously revised to take into account the continuing rapid improvement in weapons and weapons delivery systems. The plans, policies, and procedures need to be adjusted to take advantage of each metropolitan target zone's geographical and other characteristics

A. Conclusion.—With the rapid progress currently being made in production of higher yield weapons and weapons carriers by many nations, United States plans and operating procedures need to be critically reexamined and continuously revised to keep abreast of progress and to meet a variety of contingencies. during the period of the 20,000-ton nominal bomb and very short expected warning time, the simple rule was "duck and take cover to survive." With the advent of larger weapons, the rule was changed to "evacuate and survive" as soon as the anticipated warning time gave promise of improving from around 10 minutes to about 1 or 2 hours. In the light of present progress in weapons and weapons carriers, such simple procedures are inadequate and need to be critically reexamined in terms of what the situation is in each metropolitan target zone. Specific and skeptical studies will be required to determine in what areas and under what circumstances evacuation may be practical, and in what areas it may be impractical. It is understood that such studies are to be undertaken.

Certainly, in the planning phases of nonmilitary defense, one must look ahead to a period of at least 3 years hence, possibly more. Indeed a 3-year span from the planning of a program to its effective implementation is highly optimistic in view of the character of the program involved—witness our slow performance to date in this field. Possibly at the present time and certainly in the near future, every individual citizen and official of each metropolitan target zone should know and should be prepared to take specific steps in proper succession or singly to meet a number of different contingencies. These specific steps will change as weapons and weapons delivery systems improve. Thus, each metropolitan target zone should prepare and should improve each year a nonmilitary defense plan peculiarly suited to its location and situation.

Appropriate plans and procedures need to be prepared for each of the following contingencies:

1. Delivery of megaton bombs of from 5 to 50 megaton size by long-range manned bombers with normal or average warning time of from 1 to 2 hours.

2. Delivery in our metropolitan regions located in coastal areas of megaton bombs by missiles fired from offshore submarines with average warning of 30 minutes or less. Closely allied is the problem posed by the feasibility of using nuclear mines.

3. Delivery in the not too distant future—6 to 10 years at the most but possibly much sooner—of megaton bombs by an intercontinental ballistic missile with not more than 10 to 20 minutes of possible warning time.

4. Issuance of a strategic intelligence warning that an attack on the United States may be imminent. Such a warning might be based on such varying circumstances as the presence of large numbers of foreign submarines in offshore waters, menacing movements or preparations of enemy armed forces, outbreak of hostilities in distant parts of the world where the United States is apt to be involved directly or indirectly, and other similar occurrences.

5. A situation where certain metropolitan target zones have been attacked and where others have not: what action should be taken in the nonattacked areas?

6. Peacetime disasters resulting from hurricanes, tornadoes, fires, explosions, and other catastrophes where civil defense can assist and also obtain desirable training.

As a start, four categories of warning should be recognized with a specific course of action to be prescribed. These are:

1. Strategic warning given days in advance based on a deteriorating situation and enemy mobilization activities.

2. Two hours or more warning, based on detection of attacking aircraft by our distant early warning or overseas networks, or intelligence of enemy deployments.

3. Emergency warning minutes before attack.

4. No warning at all, with an attack coming as a surprise.

In 1955, the early warning time to be taken as the norm or average for training purposes may be from 1 to 2 hours for some metropolitan target zones; in others, because of their location, it might be longer. By 1959, it is probable that this range might be from 2 to 3 hours against manned bombers. The United States needs to develop the habit of keeping abreast of improvements and changes by yearly revisions of the nonmilitary defense plans of each metropolitan target zone.

In view of the possible variations in warning time ranging from no warning at all to a strategic warning of days or weeks, it would seem that civil-defense policy cannot depend upon any single solution exclusively, be it shelters, evacuation, industrial dispersion, or diminution of population densities. At the present time, evacuation has been advocated by some as the sole and complete solution of the problem. Certainly, a proper evacuation to reduce population peaks could save lives in the event of attack. On the other hand, evacuation of population into areas where they are unprotected from fallout or where they may be reconcentrated to provide new targets is highly inadvisable. The best situation to develop is a balance that involves reducing the population densities over as large an area as possible. The individuals who are not evacuated and remain in the cities should be provided with shelter, some protection from blast, fire, neutrons, fallout, and chemical and biological agents. Likewise, similar protection is required to an appropriate lesser degree in outlying areas as the possibility of exposure becomes less, even though protection from fallout and from chemical and biological agents is essential in all areas within several hundred miles of likely targets. The fallout pattern will be different for each metropolitan target zone and will, of course, vary at different times for each zone by virtue of wind variations and size of blast.

Evacuation planning must be in accord with the principle that the individual utilizes all available time and takes advantage of all facilities that will substantially lessen his danger and improve his chances of survival. While evacuation is highly desirable as a means of spreading out population with the consequent reduction in fatalities, the critical problem is how much time will it take, how much time will be available, and how many are likely to follow evacuation instructions in a real emergency. When low-yield bombs were considered, the radius of destruction was relatively limited, and evacuation could be limited to the population within a radius of a few miles around the presumed aiming point. The radius of total and partial destruction is now much greater. Instead of having almost complete destruction aboveground within a hlaf-mile of the point of burst, as in the case of the earlier atomic bombs, we would have, in the case of a 20-megaton bomb, virtually complete destruction aboveground within a radius of 5 miles of the burst and a somewhat greater radius if we dealt with a 40- or 50-megaton weapon. Even with high-yield bombs, however, the cratering effect with consequent destruction of well-constructed shelters underground is very limited compared with the total area affected. This means that population in suitable shelters would be safe from the primary blast effects except in a very narrow area, whereas with evacuation we would not only have to move a very much greater population, but also if the evacuating population were caught out of shelter, it would be very vulnerable, even outside the area of heavy destruction, to danger by flash burn and flash radiation and, over a very wide area, to danger by fallout. The latter damage would be only mitigated to a small extent by the shelter afforded by motor car. However, fire, storm, or conflagration might require a postattack evacuation.

The theory of evacuation postulates a warning of several hours before the attack is delivered. Our military defenses will have met the enemy as far out as possible with the hoped-for result that at the very worst, enemy bombs will

have to be dropped, if at all, away from the ideal aiming point. Where bombs fall has been and always will be rather unpredictable when there is an effective air defense. Thus, not the core of the city but a large portion of the metropolitan area must be regarded as the aiming point. Plans for evacuation of so large an area under the many different possible conditions would have to be exceptionally complex. If, in addition, we try to place principal reliance on a policy of evacuation rather than on a policy of shelter for the populations in regions covered by the presumptive fallout of nuclear bursts, we have an unmanageable problem.

On the other hand, a solution of shelter alone is inadequate. Without some measure of evacuation, the high population densities of city centers are lucrative targets and thus the most sought-for and probable points of bomb detonation, with resulting mass deaths. Moreover, the management of a highly concentrated, panic-stricken populace in the vicinity of a detonation would be exceedingly difficult after the blast when communication and transportation facilities are inoperative and when radiation hazards are extremely high. Long-range programs for reducing urban vulnerability, while they have the advantage of remaining effective despite the radical changes in weapons technology and in warning time and of offering peacetime benefits as well, cannot do the entire civil-defense job either.

The solution would appear to be in a sensible combination of both evacuation and shelter measures, with the need for both moderated by a gradual reduction in urban vulnerability. Individuals who, for one reason or another, should remain in the central target area should be permitted to stay but with adequate shelter provisions. Those who can leave should be evacuated to areas of "substantially greater safety" where they will have protection from fallout. The objective should be to utilize available time to the maximum in order to spread out and reduce population densities. This will tend to minimize casualties from any given burst, whether at the city center or on its periphery. Such a combination of evacuation and shelter measures not only will increase the average expectancy of individual survival but will also reduce the problems of either evacuation or shelter, making each one more practicable of accomplishment. The specific combination of measures depends on the geographic and other peculiarities of each metropolitan target zone and merits case-by-case analysis, out of which should come specific policies and operational procedures appropriate and practical for the metropolitan target zone in question.

B. Recommendation.—That the Federal Civil Defense Administration revise its policies and operational procedures to emphasize:

1. There should be a nonmilitary defense plan for each metropolitan target zone. The extent of each of these target zones should be prescribed by local authorities in consultation with the Federal Civil Defense Administration. While adhering to certain general principles, the plans should be designed to meet the special needs and circumstances of each zone.

2. These nonmilitary defense plans should be revised yearly to keep abreast of change.

3. These nonmilitary defense plans should include operational procedures to meet the contingencies of:

(*a*) Strategic early warning of days or weeks;

(*b*) Early warning of an appropriate norm or average, depending upon the location of the metropolitan target zone and the state of development of our early warning system (1 to 2 hours could be taken for 1956, and possibly 2 to 3 hours by 1958);

(*c*) Emergency warning minutes before attack;

(*d*) No warning at all.

4. In the civil-defense operational procedures, there should be a place for both evacuation and shelter along with a general reduction in urban vulnerability, but this principle should be applied only after careful consideration of the particular situation in each of the metropolitan target zones and of the various contingencies in warning time.

III. The technique of utilizing metropolitan target zones for planning and operations in nonmilitary defense will require a material increase in the Federal Government's leadership, authority, responsibility, and operational control of nonmilitary defense while retaining the essential elements of State and local participation and responsibility

A. Conclusion.—The Administrator of the Federal Civil Defense Administration is responsible for the civil-defense aspects of nonmilitary defense. At present, he does not have sufficient authority to discharge his responsibility. At

present, his relationship to State and local civil defense is essentially advisory. At present, he can only suggest, and if State and local civil-defense officials do not respond, he can do nothing to enforce policies even though he will be the official principally criticized for any inadequate performance and made the scapegoat at the time of disaster.

The Director of the Office of Defense Mobilization is in much the same situation. Governors and mayors now resent the fact that the Federal Government has indicated that local officials have immediate responsibility for what is believed locally to be a part of national defense and, as such, a responsibility of the National Government. In addition, local and State officials insist that they have not the funds, facilities, nor the personnel needed to discharge such a responsibility even if they accepted it.

The remedy, however, is not to be found in shifting from one extreme to the other. The existing situation can be described as the one extreme where complete and sole operational responsibility for civil defense rests with the State and the city. It would be equally wrong and unsatisfactory to shift to the extreme of absolving State and city governments from all responsibility and of placing it exclusively on the Federal Government. Actualy, State and local governmental machinery, personnel, and facilities must be used to the ultmost in a civil-defense emergency. With the scope of civil defense being so enormous, there is no other possible means as available or as effective. In addition, governors, mayors, and other State and local officials are by the inherent nature of their duties responsible for public safety and welfare. Bluntly put, it would be sheer folly for either governors, mayors, or other State and local officials to be excused from their unavoidable responsibility for planning, training, and operations in their particular jurisdiction in the field of civil defense.

But the concept of local and State responsibility does not mean that the Federal Government cannot or should not do substantially more than it has been doing in terms of financial support, staff coordination and supervision, and active leadership. This cannot be done all at once but should evolve gradually if Federal, State, and local officials can work together in the solution of specific metropolitan target zone problems. This hiatus or gap that now separates the responsibility of Federal Government on the one hand and the State and local governments on the other can be closed by planning and operating nonmilitary defense on a metropolitan target zone basis in a manner whereby the best elements of cooperative Federal, State and local participation are obtained.

It is suggested that the Federal Civil Defense Administrator designate one member of the Federal Civil Defense Administration as the Federal representative for each of the 14 largest metropolitan target zone areas. It would then be appropriate for the Federal Civil Defense Administrator to request that a designated representative be appointed by each of the governors of the States and the mayors of the principal cities involved in each of the 14 largest target zones.[2] It would be appropriate for the Federal representative to be the chairman of the ad hoc committees thus established. The zone plans must include the role to be played by the military, and it is therefore important that the Secretary of Defense designate a responsible and informed representative for each zone committee. It would be desirable for the Federal Civil Defense Administration to allocate to its representative the funds required to defray the costs of the necessary planning work. It would be advisable to employ research assistants who are resident in the metropolitan target zones involved. A very rough estimate is that an average of $100,000 and 9 months' time would be required for the preparation of the initial nonmilitary defense plan for each metropolitan target zone. Subsequent yearly revisions would cost far less and be very much less difficult.

All during the study, local committees must have direct access to a central responsible point in the Federal Government which can answer questions as they arise or can attempt to secure the answers if the Government has none at the moment. No matter how firm the initial agenda, there are so many points at which no one is prepared to state a policy that the local committees will not be able to operate without excellent liaison at a high level in Washington. Much

[2] There is no special significance in designating 14 metropolitan target zones to be studied initially. The number could be smaller or larger. The number of 14 was selected because there are 14 metropolitan target zones containing populations of 1 million or more in each zone. In addition, 14 is believed to be a manageable number which, at the same time, will provide a sufficiently broad cross-section to be typical of the entire national problem.

time and money will be wasted at the local level unless there is sufficient advance agreement and instruction from the Federal Government concerning its policy, its responsibilities, the financial burden it will assume, and what it expects of the local organizations. Allowances should be made for considerable variation for various localities. There must be direction from the Federal Government in the preparation of the agenda; otherwise, the local committees and their staffs may waste time and funds in the collection of useless data. A great majority of the operations that will be needed for nonmilitary defense are already in being under existing agencies, and experts from these agencies should be called on for assistance as a guaranty against unwarranted duplication. Also, experts from Federal agencies can help. The local city planning experts would have much to offer local committees as would also representatives from commercial, professional, and academic circles.

B. Recommendation.—That the following steps be taken to plan, organize, and operate nonmilitary defense on a metropolitan target zone basis:

1. As a first step, the Federal Government through the Federal Civil Defense Administration, finance the study and preparation of a nonmilitary defense plan for each of the leading 14 metropolitan target zones designated by the Federal Government.

2. The Federal Civil Defense Administration designate a Federal representative with appropriate staff for each of the 14 metropolitan target zones to be studied initially.

3. The governor of each of the States and the mayor of each of the principal cities in each metropolitan target zone designate a representative (probably the State and local civil-defense directors concerned) to serve on this nonmilitary defense ad hoc committee. Likewise, that the Defense Department designate a member.

4. The Federal Civil Defense Administration allocate each committee a sum not to exceed $100,000 for each target zone and that a period of 9 months be allotted for the preparation of the 1957 nonmilitary defense plans for each of the 14 leading metropolitan target zones.

5. In the preparation of these nonmilitary defense plans, the assumption be made that for the carrying out of these plans, there will be a sharing of the costs as indicated in the budget annexed to the plan by the local and State governments involved and by the Federal Government. Thus, these plans will have to be approved by the mayors and governors concerned and also by the Federal Government. Until these nonmilitary defense plans for each metropolitan target zone are formulated and priced up in terms of annual operational costs, it is difficult to recommend a precise formula for cost sharing. Greater participation in cost sharing by the Federal Government is urged, but this requires congressional action which cannot very well be taken until a number of the plans are available for scrutiny.

6. As a suggested pattern, the nonmilitary defense plan for each of the metropolitan target zones be developed on the basis that the local civil-defense organization is the first line of defense, the State civil-defense organization will provide the support forces, and the Federal target zone chairman will control the employment of support from both inside and outside of the metropolitan target zone that may be needed to assist the local and State civil-defense forces that have been committed.

7. Each year the nonmilitary defense plan for each metropolitan target zone be revised and improved and then submitted along with budget estimates for Federal approval or modification. This yearly revision of the nonmilitary defense plan for each metropolitan target zone is especially important. It permits a modest start to be made on the basis of fairly complete agreement and cooperation on the part of all involved—governors, their civil-defense directors; mayors, their civil-defense directors; and the Federal Government through the Federal Civil Defense Administration. Training exercises and experience will dictate improvements. Cooperation and the utilization of all local services can be developed on a functional basis, i. e., the police chiefs, the fire chiefs, the water supply officials, etc. of a particular target zone can join together in determining how their operations can best be conducted. The same is true for transportation, continuity of utility services, welfare, public health, etc.

8. The Federal Civil Defense Administration be required to make a test inspection each year to ascertain how the program is being carried out and whether the Federal funds involved are being effectively and economically expended. Where necessary, the inspecting agency should have the authority to

suspend, when necessary, further Federal fund payments until irregularities and deficiencies have been corrected.

9. If the experience developed in planning, organizing, and operating nonmilitary defense in the 14 metropolitan target zones first to be attempted is considered to be successful and effective, then steps be taken to organize the remaining metropolitan regions of the country in a similar fashion.

10. During the interim period, the Federal Civil Defense Administration function as presently constituted, using the existing Federal, State, and local organizational mechanisms.

11. The necessary reorganization of those areas of the United States not to be included in the 14 metropolitan target zones initially established be postponed pending the determination of the success and feasibility in the metropolitan target zones initially tested.

12. Insofar as may be necessary for the implementation of the recommendations contained in this report, Congress amend the provisions of the Civil Defense Act of 1950, Public Law 920, 81st Congress.

IV. In the overall nonmilitary defense plan for each metropolitan target zone initially established, there be incorporated and integrated the existing disaster plans of the Armed Forces of the United States for each area.

A. Conclusion.—In our opinion, it is essential to preserve and strengthen civil controls and competence of local and State governmental machinery to handle civil-defense emergencies. It is equally important to preserve and strengthen the ability and the capacity of the Armed Forces to prosecute the war. Thus, during a disaster period it may be necessary for State and local governmental machinery to obtain substantial assistance for a short period from the Armed Forces. But it must be done on a basis where the Armed Forces do not become so involved or so completely responsible that they cannot be speedily withdrawn or that major emphasis cannot be given to initiating military action against the enemy.

One of the present handicaps to coordinated planning and action is that each component of the Armed Forces has its own disaster plans. The Army has its own disaster plans for each of the Army areas into which the United States is divided. The Air Force and the Navy have similar plans, but they are integrated with the Army plans. All are classified, with the result that State and local civil-defense directors have little or no knowledge of their details. Widespread public knowledge that each of the Armed Forces has such disaster plans has encouraged many citizens and many local governmental officials to sit back and do nothing in the hope and belief that the military will take over in time of emergency. This possibly fatal notion would be dispelled if there was a single well-integrated and well-known nonmilitary defense plan for each metropolitan target zone in which the Armed Forces had supporting and integrated rather than independent roles. This could be accomplished by having the Defense Department designate its representative for each of the 14 metropolitan target zones to be established initially. The military representative would prepare and be responsible for obtaining Defense Department approval of that part of the nonmilitary defense plan for each metropolitan target zone that involves participation or assistance of military forces and the manner in which they are to be employed. Detailed planning on the use of military forces does not appear to be difficult once the following principles are established: the civil authority as exercised by Federal, State, and local government should be preeminent; available military forces should render all possible assistance, acting as one of the several elements of the community; and the military should become involved only to the extent that it does not conflict with or impede their strictly military responsibility.

B. Recommendation.—That the overall nonmilitary defense plans to be formulated in the 14 metropolitan target zones incorporate and integrate the disaster plans of the Armed Forces who are to assist, acting in concert, as one of the several elements of the community and to a degree which their direct military responsibilities will permit.

V. Defense should be greatly strengthened by utilizing military personnel and units for mobile support units.

A. Conclusion.—Progress in the development of nuclear weapons with the consequence of ever-increasing destructive potential further emphasizes the critical need and importance of well-organized and well-equipped mobile support units that can go into a disaster area from nondamaged areas. The absence

of effective mobile support units has continued to be one of the most serious defects of civil-defense preparations.

It would seem that the passage by Congress of the Reserve Forces Act of 1955 (Public Law 305, 84th Cong.) provides a timely opportunity for the Administrator of the Federal Civil Defense Administration and the Secretary of Defense to work out a practical and economical way for more effective support and assistance to civil defense by the military.

This does not involve any change in the viewpoint expressed in the Project East River Report in 1952 that responsibility for civil defense should not be turned over to the military. It is still our view that major reliance in an emergency must continue to be placed on individuals and organizations that normally do comparable work and that the supervision and responsibility for civil defense must be exercised by existing civilian, local, State, and Federal governmental machinery. However, this concept does not preclude every possible assistance by the military so long as this does not place primary responsibility on the military or involve them so completely and inextricably as to handicap their ability to take appropriate military action against an enemy. Their assistance on this basis is consistent with the necessary prerequisite to military operations that prompt steps be taken to cope with nuclear bomb damage in the United States in order that the country can support military operations on a large scale.

It is believed that military participation in disaster operations can be most effective and least handicapping to their combat responsibilities by direct cooperation in support of civilian local, State, and regional civil-defense organizations. This requires agreement on certain basic planning principles and operational procedures between the Defense Department and the Federal Civil Defense Administration. It is suggested that agreements be reached which will permit local and State civil-defense officials to incorporate in their planning the utilization of military personnel and units in mobile support roles on a basis that will permit their early release for strictly military action.

B. Recommendation.—That the Secretary of Defense and the Administrator of the Federal Civil Defense Administration work out principles and procedures to permit military personnel and units to be utilized on a temporary basis and in a supporting role by civilian local, State, and regional civil-defense organizations. In this connection, it is suggested that opportunities provided by Public Law 305, 84th Congress, be explored with a view toward utilizing in the civil-defense program some part of the Ready Reserve and the Standby Reserve in addition to available regular military forces.

VI. Industrial dispersion and reduction of urban vulnerability need reemphasis, and additional implementing techniques on both the Federal and the metropolitan target zone levels are necessary

A. Conclusion.—The recommendations contained in the Project East River Report (Pt. II–B: Federal Leadership to Reduce Urban Vulnerability, and Pt. V: Reduction of Urban Vulnerability) sought to attain (1) the dispersion of key defense industry on the general assumption that such facilities should be moved entirely out of likely damage areas, and (2) the reduction of overall urban vulnerability by a series of measures aimed at reducing congestion or improving protection on the general assumption that losses might be in this way substantially reduced even though urban centers would remain likely targets. These goals are still sound and need to be reemphasized.

The standard for industrial dispersion initiated by the National Security Resources Board, adopted with modifications by Project East River, and recognized until recently by the Office of Defense Mobilization, called for location of new key defense plants at least 10 miles beyond the limit of the target zone. There has been some dispersion of industry. For the most part, the dispersion program has been addressed to those commercial facilities that play a key role in the production of military items. The dispersion of military production is far from an adequate or complete solution. Such dispersion will indirectly result in the scattering of other supporting industries, and this in turn may disperse populations generally, thus achieving some reduction in urban vulnerability. It is our opinion, however, that there are two serious deficiencies.

First, the Federal dispersion program has been far too limited. The dispersion of military production is an important facet and should be continued. But there are other facets that may be of greater importance. The principal production problem in the United States in the event of war may well be not the manufacture of military supplies and weapons but the production of those basic items needed for the rehabilitation of the civilian economy and for the reestablishment of our

entire economic structure. Thus, dispersion must be applied in a much broader sense. So many industries will have a key role in recovery and rehabilitation that they will comprise a virtual cross section of the present economy. As to how large a portion of our economy must be dispersed, one suggestion was to set a balanced 30 percent of our gross national production as an immediate first objective. This is based on the estimate that the U. S. S. R. production capacity is about 30 percent of our present level. Furthermore, many industries in the United States are already dispersed almost to this extent.[8] If advantage were taken of every situation over a 10-year period, a general and significant dispersion could be easily achieved. Of course, additional surveys will be needed from time to time to make sure that changes will be made as conditions warrant.

Second, no serious attempt has been made to bring about the reduction in urban vulnerability recommended by Project East River. To reiterate the recommendations of Project East River, such reduction can be promoted by a sensible combination of three measures:

1. Protection by spacing and distance;
2. Protection by improved construction standards, including shelter areas;
3. Protection by better close-in military defenses of highly concentrated areas.

Except for the third of these, action must come at the metropolitan level. But if localities are to do the main job, the Federal Government must take positive steps with respect to dispersion, giving badly needed Federal leadership by setting an example in new Federal construction as to what should be done. In addition, the Federal Government must contribute substantially in the broader aspects of the reduction of urban vulnerability through development of standards and incentives. In each case, application must be accomplished locally with consideration given to the geographic and other peculiarities of the metropolitan zone.

In reducing urban vulnerability, the primary objectives are to save lives and to preserve the metropolitan community with a minimum of damage so that it can, after attack, restore the essential elements of its services and economy to rise again as an essential part of national life. This function is essentially a local metropolitan responsibility to be established through proper zoning, proper location of industrial facilities, proper design of mass transportation arteries and facilities for communication, and reduction of the hazards of fire, storms and conflagrations. In promoting the reduction of urban vulnerability, the close relationship of industrial location and population density becomes important.

Indirect means should be utilized as far as possible to implement the program of reducing urban vulnerability as outlined in the 1952 Project East River Report. By working through a metropolitan target zone nonmilitary defense plan for successive years, it should be possible to stimulate the construction of circumferential highways that will then induce spreading out and reduction of population densities. The same is true for industrial facilities. Proper application of policies that could be adopted by the Housing and Home Finance Agency could do much in the area of slum clearance to reduce high population densities in the centers of large cities and to reduce land coverage and population density in new multiple-dwelling rental housing built through the medium of FHA-insured mortgages. There are a number of other specific measures that could be adopted, but the main point is that indirect measures need to be found which are politically and economically acceptable.

The Project East River Report recommended that the Federal Government demonstrate the importance of reducing urban vulnerability in general by taking the lead in setting an example through the application of urban defense standards to all of its own building programs and by so conducting its highway and other related programs as to give every possible encouragement to the spreading out and proper spacing of new urban developments. The urban defense standards proposed by Project East River are still considered sound and appropriate, but they have not been applied. It is urged that they be applied by the Federal Government.

B. Recommendation.—That the programs for industrial dispersion and reduction of urban vulnerability be given renewed emphasis on the following basis:

1. A determined and sustained effort needs to be made to promote Federal

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[8] Development of integrated nonmilitary defense plans on a metropolitan target zone basis will provide the information upon which this 30 percent objective can be tested and modified. In addition, logical and enforcible means of approaching the designated goal will then be discernible.

leadership in the reduction of urban vulnerability as outlined in part II–B of the Report of Project East River. To date, very little along this line has been either attempted or accomplished.

2. Leadership in the field of industrial dispersion is essentially a Federal responsibility. The work of the Office of Defense Mobilization in analyzing key industries to uncover undue concentration in any one locality and to induce a spreading out geographically should be continued with the goal that within the next 10 years a reasonable minimum and properly balanced portion of our total national production with the necessary accessory facilities therefore be established outside of metropolitan target zones. Thirty percent has been suggested but this standard obviously needs testing, and any standard will probably require frequent modification with the passage of time. In these programs, emphasis should be placed on the location of new facilities in order to accomplish the goals.

3. The nonmilitary defense plan for each of the metropolitan target zones should include a section devoted to the reduction of urban vulnerability along the lines suggested in part V of the Project East River Report. The standards therein can still be used as broad general guides but altered to fit the peculiar geographic and other circumstances of a given metropolitan target zone. Emphasis should be given to those positive indirect measures such as circumferential highways; utility extension; park, forest, wildlife, and greenbelt projects; and slum-clearance programs that can get strong local support and that will indirectly promote the reduction of urban vulnerability. Action at the Federal level will be needed to obtain favorable consideration from the many Federal agencies involved for the locally prepared and locally approved programs. Promotion and help in the preparation of these parts of the nonmilitary defense plan for each metropolitan target zone should be given by both the Office of Defense Mobilization and the Federal Civil Defense Mobilization and the Federal Civil Defense Administration.

VII. Steps should be taken to improve the organizational framework and to increase the status, prestige, and funds available to the Federal Civil Defense Administration and the Office of Defense Mobilization.

A. Conclusion.—The task of planning and operating nonmilitary defense is new, important, and exceedingly complex. Nonmilitary defense will continue to be important for the foreseeable future, and the governmental agencies responsible for that program need to be considered as an important permanent part of our governmental structure. Because reliance must and should be placed on the delegation of a substantial part of both the planning and the operation of the nonmilitary defense program to the various departments and agencies of the Federal Government, both the Federal Civil Defense Administration and the Office of Defense Mobilization need to have sufficient status and prestige to effect the coordination and implementation of this program. Practically speaking, every major department of the Government has been given a role in the overall program. It is not reasonable to expect a secondary agency to coordinate the work of the established, first-line governmental departments enjoying a higher status.

The Federal Civil Defense Administration has the especially important task of working with all of the 48 State governments. In addition, it needs to promote better relations with city and other local governments. Obviously, the status and prestige of the Federal Civil Defense Administration in the Federal organizational framework affects materially its effectiveness and ability to work with States and cities.

Public Law 920, which provided for the establishment of the Federal Civil Defense Administration, indicates clearly that there are to be two roles for the agency. Prior to an emergency, the Federal Civil Defense Administration is to be essentially a staff agency, responsible for the development of plans and policies. At the time of an emergency, the Federal Civil Defense Administration is to become a civilian operating agency for the President to employ in the immediate postattack phase. Time has clarified these roles in some respects. It is now obvious that civil defense involves preattack actions as well, e. g., dissemination of warning and information to the public, evacuation, etc. On the other hand, a possible definition of a cutoff point for the immediate postattack phase has become more difficult. An additional component was introduced by Executive Order 10427, January 16, 1952, by which the Federal Civil Defense Administration has been given an operational responsibility for Federal action in the so-called natural disasters such as the Diane flood.

The Office of Defense Mobilization is included in the Executive Office of the President along with such agencies as the Bureau of the Budget, the National Security Council, and the Council of Economic Advisers. By this organizational position, the Office of Defense Mobilization should be a staff agency. It received from its predecessors responsibility for developing Federal policies and plans for rationing and similar controls, for reducing our vulnerability to attack, for postattack rehabilitation, and for establishing policies (including goals) for the stockpiling programs. There are some individuals who believe the Office of Defense Mobilization's responsibilities for nonmilitary defense include an overall, policymaking, coordinating role in which civil defense is a part. There are those who are of the opinion that the Office of Defense Mobilization has no jurisdiction or staff function with respect to the Federal Civil Defense Administration and its sphere of action. The dispersion of industry, similarly, is divided among the Office of Defense Mobilization and the Departments of Commerce and Defense. The Office of Defense Mobilization has deemed it necessary to establish regional offices to facilitate operations such as putting into effect the postattack programs for rationing and materials controls.

The description given above for the Federal organization for nonmilitary defense is greatly oversimplified. The Departments such as Defense, Commerce, and Health, Education, and Welfare have duties and responsibilities as do also independent offices such as the Atomic Energy Commission. The situation is further complicated because a proper continental defense in modern warfare permits no sharp boundary between the military and nonmilitary phases nor, in time, between the preattack, attack, postattack, and rehabilitation phases. The President, of course, is responsible for overall national security, but the division and coordination of duties and responsibilities under him require further clarification.

The respective roles of the Federal Civil Defense Administration and the Office of Defense Mobilization leave much to be desired. Much of the work of these two agencies is most intimately interrelated, and to attempt to separate them by subject or by time-phase is artificial and leads to confusion and duplication.

While it is easy to suggest that there be organizational improvements and that the status, prestige, and effectiveness of these nonmilitary defense planning and operating agencies be increased, it is difficult to obtain any general agreement on how specifically this can best be accomplished. One suggestion was to combine the Federal Civil Defense Administration and the Office of Defense Mobilization in the Executive Office of the President. Some argue that such a combination would eliminate the separation of civil defense from the other parts of nonmilitary defense. Another suggestion has been to give Cabinet status to the Administrator of the Federal Civil Defense Administration. There may be merit in designating the Administrator of the Federal Civil Defense Administration as a member of the National Security Council. Other suggestions have been to place the Federal Civil Defense Administration in the Executive Office of the President or to make it the fourth major element of the Department of Defense along with the Army, Navy, and Air Force. To suggest specific organizational changes or to evaluate the various alternative suggestions is beyond the scope of this committee. However, the need for organizational improvement, increased status, prestige, and effectiveness is clear. A much needed action has been started by the President in asking that his Advisory Committee on Government give its attention to this subject.

B. Recommendation.—That steps be taken at the Presidential level to improve the organizational framework and to increase the status, prestige, and effectiveness of the work now being attempted in the field of nonmilitary defense by the Federal Civil Defense Administration and the Office of Defense Mobilization.

VIII. The public information and education program of the Federal Civil Defense Administration needs to be made more effective

A. Conclusion.—During its entire existence, the Federal Civil Defense Administration has never been able to obtain the public understanding and response which is so essential for its largely voluntary program. The individuals in the several appropriate Federal agencies responsible for such public programs have tried diligently to accomplish their assigned tasks within the security framework prescribed by higher authority. There has been improvement in the transmission of information, both public and classified, to the Federal Civil Defense

Administration by originating agencies such as the Atomic Energy Commission and the Department of Defense. However, as the recent hearings of the Joint Committee on Atomic Energy of the 84th Congress indicate, there is substantial room and need for further improvement, particularly with respect to what each citizen should know and be prepared to do about fallout.

Public education programs and the mass media—radio and television, newspapers and magazines—have provided significantly large coverage, frequently of a repetitive nature. In addition, key individuals at all levels of government have seized eagerly every opportunity to make public appearances on radio and television as well as in speeches before citizen groups throughout the country to get their story across to the public. Yet the fact remains that the public is not now adequately motivated nor is it giving sufficient support and participation in nonmilitary defense preparations. This is the case for both individual citizens and for commercial and industrial organizations and associations.

Citizens of the United States, both as individuals and collectively, have always responded throughout our national existence whenever there has been a clear and urgent call to duty. In our opinion, the public has not had an understandably clear call to duty. At the risk of oversimplification, it can be concluded that this biblical quotation is highly appropriate, "For if the trumpet give an uncertain sound, who shall prepare himself to the battle?"

In view of the general optimism on the prospects of further easing international tensions and insuring the peace, the general public especially needs at this time to be reoriented by an authoritative statement on the present need and status of civil defense. To end the existing confusion and uncertainty, a carefully considered statement should come from no less a person than the President. It should advise what civil-defense measures are still necessary and what specific part each level of Government and each citizen should play.

It is not believed that such a statement could be issued immediately because up-to-date policies and plans are lacking. In particular, there is needed a specific and detailed directive on what each individual citizen ought to be prepared to do and why he should do it. In addition to being specific, it must make good sense to the individual citizen irrespective of what town or city throughout the entire United States may be his place of residence.

When an up-to-date and realistic program is announced, it should be accompanied by a concerted effort to persuade all key Federal, State, and local officials in both the military and nonmilitary fields to take especial care lest improperly considered or uncoordinated future, presumably authoritative statements again confuse the public. In this connection, it is vital that the Federal Civil Defense Administration obtain full information promptly of advances in weapons technology are to be matched by adequate changes or adjustments in civil-defense policies and programs. In addition to obtaining this information promptly from the Defense Department, the Office of Defense Mobilization, the Atomic Energy Commission, or the National Security Council, it is equally important that the Federal Civil Defense Administration formulate and disseminate promptly the changes in civil-defense policies and procedures that are dictated by progress in weapons and by changes in the Military Establishment and the international situation. To help close the gap between military and nonmilitary preparations, the Federal Civil Defense Administration should have sufficient advice on new weapons developments to permit concurrent studies on necessary revisions of civil-defense policies, plans, and programs. If forced to wait until the weapons improvements are tested, the Federal Civil Defense Administration is handicapped by a 2- to 3-year time lag. Ideally, civil-defense changes should be publicized simultaneously with the announcement of technical improvements or other changes affecting our military defense.

B. Recommendation.—That the public information and education program of the Federal Civil Defense Administration be made more effective by taking the following steps:

1. An up-to-date and specific statement be prepared that will inform each citizen, irrespective of his place of residence in the United States, what he should be prepared to do in a civil-defense emergency and what the official program of the United States is in the field of nonmilitary defense even though the international situation and the prospects for peace have improved.

2. As soon as an up-to-date program can be formulated, it be announced throughout the country, preferably by the President, in a nationwide television program and in a manner that is not likely to arouse undue apprehension.

3. Once a specific program is announced, special efforts be made to coordinate future, presumably authoritative statements by key Federal, State, and local

officials to the end that the public will not again become uncertain and confused because of widely different and contradictory opinions.

4. The Federal Civil Defense Administration receive prompt and complete information on improvements in weapons technology and changes in the international situation or the Military Establishment which affect the civil-defense program. On the basis of such information, the Federal Civil Defense Administration should promulgate promptly the changes that thus need to be made in their policies and programs. The ideal would be for the Federal Civil Defense Administration to announce changes in their programs simultaneously with the release of information by the Department of Defense, the Atomic Energy Commission, or the National Security Council on weapons improvements and other changes in the Military Establishment or in the international situation.

EXHIBIT 1

[New York Times, June 12, 1955]

CHEAPER H-BOMB IS NOW POSSIBLE—SIZE OF WEAPON VIRTUALLY LIMITLESS, AEC INDICATES—FALLOUT PERILS BARED

By Anthony Leviero

WASHINGTON, June 11.—The Atomic Energy Commission has officially indicated that the thermonuclear or hydrogen bomb can be made with the cheapest atomic explosives and in virtually limitless size.

The Commission has also indicated that lethal or damaging doses of radioactive fallout may persist for a long time.

Both significant points were contained in a speech by Dr. Willard F. Libby, member of the Commission. The speech received scant notice when Dr. Libby delivered it at a University of Chicago alumni reunion June 3 in Chicago.

It was couched in highly technical terms. For atomic scientists who are analyzing his paper, however, it was the beginning of frankness about fallout.

The nature, scope, and duration of fallout are questions of the utmost concern to civil-defense workers, who are seeking practicable data as the basis of policy on shelter and evacuation. The questions have remained in official obscurity, and consequently in dispute.

Atomic scientists here regard the Libby speech as basic confirmation of deductions that have been published since data became available on the hydrogen bomb test in the Pacific March 1, 1954.

The principal official data has come from Japanese analyses of the effect of fallout from this weapon on the crew of the *Fortunate Dragon*, a fishing boat, and from the report issued by Lewis L. Strauss, Commission Chairman, last February. The Strauss report disclosed that the explosion had spread lethal fallout over an area of 7,000 square miles, about the size of New Jersey.

Dr. Libby also discussed strontium-90, a tumor-causing radioactive product of nuclear explosions. He said atomic tests had not appreciably increased the general background level of this element, which last 30 years, but it would be a hazard in an atomic war.

The chief significance of Dr. Libby's speech was his reference to a nuclear explosion capable of releasing "10 megatons of fission energy." The key word is "fission." The ordinary atomic bomb releases energy by fissioning or splitting atoms. The thermonuclear weapon does this by "fusion" of hydrogen atoms.

Ordinary atomic bombs are placed in the kiloton category, and thermonuclear weapons in the megaton class. A kiloton is equivalent to 1,000 tons of TNT; a megaton to 1 million tons.

Dr. Libby referred to a 10-million-ton weapon that released energy by fission rather than fusion. This indicated that ordinary, cheap uranium 238 was the major explosive content and was responsible for fallout over a vast area.

SUPERWEAPONS POSSIBLE

The significance of this is held to be enormous. To physicists it means that Russia or any other country able to make ordinary atomic bombs can, with a little more effort, create superweapons of the megaton class. The great complications and expense hitherto associated with the manufacture of the thermonuclear bomb thus become negligible.

Moreover, this cheaper weapon is tremendously more deadly than a pure hydrogen bomb. The product of fusing hydrogen in the hydrogen bomb is stable helium, which is not radioactive. Such a weapon would produce only a little radioactivity from its common atomic bomb trigger.

Hence, the destructiveness of a hydrogen bomb is produced by heat and blast. By adding ordinary uranium to this weapon, the additional lethal radioactivity it created.

The scientific community now sees in Dr. Libby's speech the confirmation of their speculations and deductions, and especially those of Dr. J. Rotblat, British physicist, and Dr. Ralph E. Lapp, American atomic physicist.

In last month's issue of the Bulletin of the Atomic Scientists, Dr. Rotblat concluded that "fissions accounts for most of the energy released in the hydrogen bomb." He said that if his deductions were correct, "the so-called hydrogen bomb is in reality a fission-fusion-fission bomb."

This means that expensive uranium 235 is employed as a trigger to create the extremely high temperature needed to cause the hydrogen fusion process. Fusion creates a great flow of neutrons into a jacket of cheap uranium 238 that is "fissioned," liberating radioactive fragments.

"The potential destruction which may be wrought by this radioactivity in the fallout of a surface detonation is dealt with in the AEC report (of February), which shows that the area of lethal damage may be 25 times greater than that from the blast and heat effects," Dr. Rotblat said.

The nonofficial scientific world might not have learned that the United States had achieved a weapon vastly more powerful than a pure hydrogen bomb but for the fallout that sickened the Japanese crew 120 miles from the explosion site.

CONCLUSIONS ARE DRAWN

Scientists draw these conclusions from the Libby speech:

The superweapon is cheap.

The 10-megaton weapon mentioned as an example by Dr. Libby is merely nominal. The weapon can be made in any size because of its comparative simplicity and the cheapness of uranium 238.

The fallout persists for days, weeks or months.

In addition to its direct or external radiation effects, the weapon creates toxic products like strontium 90 and radioactive iodine in large quantities, which are internally damaging.

Dr. Libby, in his discussion of fallout and a 10-megaton "fission" weapon, did not relate these to the hydrogen bomb that was tested in the Pacific March 1, 1954. According to congressional sources, that weapon was 14 to 16 megatons.

Instead, he talked of a fallout over a 100,000-square-mile area, which scientists regard as theoretical. They assume he did this for security reasons.

The 10-megaton bomb would produce an initial dosage rate of 67 roentgens a day, Dr. Libby said. A roentgen is a unit for relating fallout dosage in X-ray exposure. The theory is that half of the persons exposed to 400 roentgens over a short period would die, while the rest would get seriously sick. Radioactivity is also cumulative.

"In other words," Dr. Libby said, "a residence or exposure time of a few days in such an area could be dangerous. Of course, realizing that the disintegration rate decreases rapidly in time, we might well say that a matter of several days would be available for evacuation, or more importantly for decontamination of the inhabited parts of the area.

"An area of 100,000 square miles is so large that evacuation may be a bit impractical. One should remember that the contamination material is a light dust which, of course, will settle extremely gently on the surface of the earth and should be easily dislodged and removed. One envisages all sorts of devices and methods so that at a contamination of 67 roentgen per day dosage rate, one ought really to be able to do very considerable in decontaminating an area.

"Of course, if this same amount of radioactivity had been precipitated over a 10 times smaller area, there would have been no hope of decontamination until the material had cooled about tenfold. But it is always true that in regions of heavy fallout, such as these two, decontamination and protective measures must follow.

"In a period of waiting for cooling to occur to a level where decontamination is possible, there is only a choice between staying indoors in shelters and shielded evacuation in shielded cars or by helicopter. Under no condition in such areas should people remain resident without shelter or decontamination."

Scientists and others concerned with the problems of civil defense dispute such a statement, or at least the official attitude it indicates. Civil-defense officials still lack practical data on fallout. If Dr. Libby had related his discussion to the 7,000-square-mile area actually polluted in the test on March 1, 1954, the data could then be applied to problems of shelter and evacuation.

Scientists note that the fallout dose that Dr. Libby used for his theoretical 10,000-square-mile area would be many times more lethal in the much smaller area that would be polluted by a 10-megaton bomb.

REFERS TO TOLERANCE LIMITS

Still using his 100,000-square-mile area, Dr. Libby said that observers with detection instruments should set reasonable tolerance limits, such as 10 roentgens, although on the day of explosion the dose would be 67 roentgens. He said this meant that persons would have to stay indoors the first day, most of the time in shelters, so as not to "run into pockets of radioactivity."

"After a week," he added, "the permissible exposure time will be 10 times longer and the radiation rate will have been reduced to about 6.7 roentgens per day, so that it will be possible to spend several hours outside."

However, Dr. Lapp has said that if the realistic 7,000-square-mile area were used, the dose would be 95 roentgens a day after the first week. It would be 2 months before it decayed to 6.7 roentgens, at which time, as Dr. Libby noted, "it will be possible to spend several hours outside."

Scientists also raise questions about strontium-90, which is hazardous because it has a life of 30 years and because it is similar to calcium, has an affinity for bones and is "a potential source of bone tumor." Dr. Libby said this element was produced by about 2½ percent of "all of the fission explosions or fission acts."

Dr. Libby said:

"It is clear, of course, that ingenious devices such as street sweepers, in which the driver sits on a bag of sand or a thick metal slab to protect him from radiation, could be used with great effectiveness. It is also clear that crews could operate with street-cleaning and fire-fighting machinery to decontaminate cities.

"In the countryside such devices as plowing fields might be most effective. The natural weathering processes which occur in the open probably are extremely effective in reducing the contamination level. In fact, just the blowing of the winds and the movement of dust and soil will help cover up the material."

CIVIL DEFENSE FOR NATIONAL SURVIVAL

THURSDAY, MARCH 15, 1956

HOUSE OF REPRESENTATIVES,
SUBCOMMITTEE ON MILITARY OPERATIONS
OF THE COMMITTEE ON GOVERNMENT OPERATIONS,
Washington, D. C.

The subcommittee met at 10:10 o'clock a. m., in room 1501 New House Office Building, Hon. Chet Holifield (chairman of the subcommittee) presiding.

Present: Representatives Holifield (chairman), Fascell, Griffiths, Riehlman, and Lipscomb.

Also present: Michael P. Balwan, staff director; Herbert Roback, director of investigations; Earl J. Morgan, James F. Eckhart, and Robert J. McElroy of the staff.

Mr. HOLIFIELD. The subcommittee will be in order.

This morning we have before us Dr. Lauriston S. Taylor, Chief of the Atomic and Radiation Physics Division and Dr. Harold K. Skramstad, Acting Chief, Data Processing Division, both of the National Bureau of Standards.

Gentlemen, we are honored to have you with us this morning. You are aware of the responsibility that this committee has been charged with, that is, making a complete study of the civilian defense situation in the United States and of course that takes us into the field of atomic radiation and we would like to have your testimony this morning as to the experimental work which you have been doing, the machines which you have developed or are planning to develop, which will be of value in the detection of radiation and the computing of dosages and in the making available to the population of instruments which are as economical and trouble free as possible in order that monitoring teams may be able to function and protect the people of their areas.

I would respectfully request that your testimony take into consideration the fact that these hearings, these statements will be read by laymen and wherever it is possible use lay language and where it is necessary to use technical scientific language, if you would just give a brief explanation of the term, so that those who read later may understand what you say.

Thank you very much.

Do you have a prepared statement, sir?

STATEMENT OF DR. LAURISTON S. TAYLOR, CHIEF OF ATOMIC AND RADIATION PHYSICS DIVISION; ACCOMPANIED BY DR. HAROLD K. SKRAMSTAD, ACTING CHIEF, DATA PROCESSING DIVISION, NATIONAL BUREAU OF STANDARDS

Dr. TAYLOR. No, Mr. Chairman. I just received notice that I was to come here the day before yesterday and I had to be in New York yesterday so all I have are some penciled notes I made on the train last night.

Mr. HOLIFIELD. I am sure your extemporaneous statement will be of interest to the committee.

Dr. TAYLOR. I will follow the outline suggested to me by one of your staff members in which there were five principal areas of interest to be covered. I am not sure that the order is particularly important. I will take it in the order suggested. The first item on this has to do with the National Committee on Radiation Protection.

This is a committee of experts that was established in 1929 and at that time was designed primarily to study problems of protection for medical users since in 1929 those were the main users of radiation. This committee has been sponsored by some 12 or 15 outside organizations and governmental departments and is operated by the National Bureau of Standards.

Mr. BALWAN. What kind of organizations sponsor this?

Dr. TAYLOR. I could give you the names of a few of them, I will read you a few names.

American College of Radiology, American Dental Association, American Industrial Hygiene Association, American Medical Association, American Radium Society, American Roentgen Ray Society, National Electrical Manufacturers Association, Radiological Society of North America. Air Force, Army, Atomic Energy Commission, Navy, Public Health and the International Association of Governmental Labor Officials.

This committee which presently has, including its subcommittee membership, something of the order of a hundred members, is closely related to the International Commission on Radiological Protection which has been in existence since 1928, and the International Commission on Radiological Units which has been in existence since 1925. These two international commissions put together all information that is available on problems of radiation protection and radiation measurements.

The committee has no regulatory authority whatever. It is purely advisory in capacity. It collects and evaluates all types of information relative to radiation protection and the practical means for achieving radiation protection and I will go into some of these points in a little more detail later.

It covers all types of radiation. It studies and evaluates the shielding properties of materials, barriers that are used for radiation protection purposes and it develops operational rules for the use of radiation sources, X-ray machines, radioactive sources, and so on.

This committee has been responsible in the past for the establishment of what we call the maximum permissible safe dose for the human body. This level was first established in 1935 or 1936 and the number established at that time, was used throughout the Manhattan District days and until it was changed by the committee again in 1946.

As a matter of record the early permissible exposure for the single individual exposed to radiation was given as one-tenth of 1 roentgen per day for a 5-day week for a 25-year working lifetime. Are you familiar with the roentgen?

Mr. HOLIFIELD. Yes, I am, but I think for the record you might state what it is.

Dr. TAYLOR. The roentgen is a unit of radiation dose. It is based on the ionization produced by a beam of radiation in a known mass of

air. By ionization I mean the act of making air electrically conducting. This is a property that you can measure with an instrument in the laboratory. You will hear the word "roentgen" a lot. I wouldn't worry too much about the technical details of it.

Mr. ROBACK. Can we inquire at this point in regard to the dosage, that is an average? What happens if this dosage is concentrated? Does it make any difference in your figures? Suppose you got it all in 2 days instead of half a year?

Dr. TAYLOR. Yes. There is a certain amount of scientific uncertainty about this at the present time. Information is lacking. There is a certain amount of recovery from radiation damage that occurs with time.

Mr. ROBACK. So that there is some decrease in the accumulation, of the effect of accumulative doses.

Dr. TAYLOR. Insofar as the well-being of the particular individual is concerned. Genetically this is not the case. Genetically all radiation exposure, or all radiation damage is cumulative. I will come to that question of the distinction between personal damage and genetic damage.

Perhaps I can take it up at this particular point. All of our protection standards until quite recently have been based on damage to an individual exposed to radiation. The level has been chosen such that on the average, no detectable injury would occur to the individual if he were exposed to these permissible levels of radiation we have set.

This is just the individual himself. But as I mentioned the genetic damage is cumulative. This can be passed on from generation to generation. This presents a very different and more troublesome problem. I might also mention that it is a problem about which there is little substantial agreement at the moment and about which a great deal is not known.

Mr. ROBACK. Your studies in your committee were established to set some kind of industrial safety or health standards for people who worked in radium-producing factories or watch factories that had radium or things like that.

Dr. TAYLOR. That's right. What we call for occupational exposure.

Mr. ROBACK. It was set up before the advent of atomic energy in the modern bomb sense.

Dr. TAYLOR. That's right.

Mr. ROBACK. And the basis for your figures are long, slow exposures.

Dr. TAYLOR. That's correct.

Mr. HOLIFIELD. As long as we have gotten into this subject of the measurement of radioactivity, you gave a formula as of what date?

Dr. TAYLOR. This maximum permissible dose?

Mr. HOLIFIELD. One-tenth roentgen per day.

Dr. TAYLOR. That was 1935 approximately and that remained in force until about 1950.

Mr. HOLIFIELD. Have you changed that?

Dr. TAYLOR. This has now been changed.

Mr. HOLIFIELD. What is your formula today?

Dr. TAYLOR. The present level is three-tenths roentgen per week. This is for whole-body exposure in both cases.

Mr. ROBACK. You decreased the tolerance?

Dr. TAYLOR. We decreased it by a factor of about two and we have allowed it also to be integrated or measured over a longer period of time, a week instead of a day.

Mr. HOLIFIELD. Instead of one-tenth per day on a 5-day week which would be a five-tenths roentgens per week, you have now changed the three-tenths roentgen for 7 days.

Dr. TAYLOR. This is again for a 5-day week.

Mr. HOLIFIELD. Is it for 25 years?

Dr. TAYLOR. This is again for 25 years.

Mr. HOLIFIELD. Was that change made because of increased apprehension as to genetic damage?

Dr. TAYLOR. The genetic damage problem has come into our consideration all the time, all the way through. The real reason for changing this was because during the Manhattan District days they put an enormous amount of effort on the study of the effects of radiation on animals and human tissue and a lot of information became available to us in 1946 which we simply did not have before.

Mr. HOLIFIELD. Was that as a result of the tests at Bikini on animals?

Dr. TAYLOR. Yes, and in part on their laboratory research.

Mr. HOLIFIELD. On this subject of mutations of the genes there have been some very large statements issued in regard to the continuance of megaton testing in the South Pacific. Do you have a substantial group of scientists who are agreed upon a motion in this field and if so what is their position?

Dr. TAYLOR. With regard to test work, I would say, "No." Our committee has not concerned itself specifically with test programs. We have, on the committee, considered the whole problem, and are considering the whole problem of the effect on populations of continued or increased exposure to radiation.

We do not have at the present time a considered answer as to what exposure we should allow the national population, assuming that everybody in the country is going to be exposed as a result of weapons tests somewhere.

Mr. HOLIFIELD. Would an attack on 50 to 75 of our urban centers and the use of megaton weapons ranging from 1 to 5 megatons, would the accumulation of radioactivity in the general atmosphere of our Nation be a matter of genetic importance?

Dr. TAYLOR. I am not a geneticist and I can only speak second handedly about genetics problems. I would say this, however. In the event of an attack of such weight as you mentioned, this would constitute a genetic catastrophe.

I think there is little doubt about that. The unprotected people who are subject to attack might be able to survive as individuals, but the genetic damage that would be passed down to later generations, I believe, would be catastrophic.

Mr. HOLIFIELD. For the purpose of making the record clear to the lay reader let us define the term genetic damage as you have used it in that statement.

Dr. TAYLOR. You are getting me into deep water here, sir, on genetics. Through damage to the genetic system, you can produce what the geneticists call genetic damage or genetic deaths. By genetic

deaths, this may be infants that die in embryo, infants that die shortly after birth, adults that die prematurely for some reason or other that is transmitted as a result of genetic damage.

Most genetic changes that take place due to radiation are considered by the geneticists to be harmful. There are some that are beneficial. On the average the geneticists say there are more harmful changes than beneficial changes.

Mr. HOLIFIELD. Would there be a likelihood of an increased percentage of abnormalities in the children who were born after such a catastrophe?

Dr. TAYLOR. I am not in a position to answer that. I believe that you can expect some.

Mr. HOLIFIELD. You are aware of course of the Argonne Lab's experiment on mice and other animals?

Dr. TAYLOR. Yes, sir.

Mr. HOLIFIELD. While this may not be completely transferable to human action, it is an indication as to what would happen, and of course we know that abnormalities have occurred there.

Dr. TAYLOR. Right. You see we are doing all of our thinking, or the geneticists are doing all of their thinking now on the basis of animal experiments. The span of human lifetime is too long to carry out any simple experiments.

Mr. HOLIFIELD. Would there be a drastically increased percentage of sterility?

Dr. TAYLOR. Well, sterility is likely to be a temporary affair.

You will produce a good deal of sterility in a large number of cases during any kind of a nuclear attack. This will be of a temporary nature.

Mr. HOLIFIELD. Can you explain the theory of persistence of changes in the genes through successive generations, just what is the theory behind that?

Dr. TAYLOR. I am afraid I can't give you that. I just don't know.

Mr. HOLIFIELD. The general theory is that there is a persistence in generation after generation of an overdose of radiation in a prior generation.

Dr. TAYLOR. On the basis of animal experiments, this is right.

Mr. HOLIFIELD. So it is not a temporary application such as sterility might be.

Dr. TAYLOR. That is correct.

Mr. FASCELL. Is it your understanding then that the genetic damage throwoff would be more abnormal than it is now?

Dr. TAYLOR. I am not sure I follow your question.

Mr. FASCELL. In other words, there is genetic damage now by reasons other than radiation?

Dr. TAYLOR. Right.

Mr. FASCELL. There is an established throwoff rate, natural throwoff rate. I don't think I know how to describe it scientifically. Nature adjusts itself in the overall picture of genetic damage without radiation.

Dr. TAYLOR. Right.

Mr. FASCELL. My question is: Is it your understanding that genetic damage by radiation so increases the balance that it would upset the throwoff rate established naturally?

Dr. TAYLOR. This is the opinion of genetics people, yes. I might just mention rather briefly some numbers that have been given on this. Dr. Muller who is one of our leading geneticists has stated that if the entire population of the country were to be exposed to 80 roentgens over and above the normal exposure that it gets now, the genetic damage would be doubled.

Mr. HOLIFIELD. That 80 roentgens would be an accumulative dose?

Dr. TAYLOR. Over the reproductive lifetime—from the time a person is conceived until the time of his last child.

Mr. HOLIFIELD. So it would not necessarily mean a temporary exposure to 80 roentgens in 1 day, that would be the same as the accumulative effect?

Dr. TAYLOR. It could be 80 roentgens in 1 day, 1 minute or 35 years.

Mr. HOLIFIELD. So it is a matter of the population being exposed to an atomic attack which lasts a week and in which you have as much as 12 or 15 roentgens a day, you have this damage which you speak of?

Dr. TAYLOR. That is correct.

Mr. FASCELL. You say that the genetic damage would be doubled at 80 roentgens.

Dr. TAYLOR. Right.

Mr. FASCELL. Is there any analysis as to how long it would take to reestablish from that damage?

Dr. TAYLOR. I have no knowledge on that. I believe that the geneticists feel that there would be no recovery.

Mr. FASCELL. If you assume a status of genetic damage now and you double it by radiation damage, it does not necessarily mean that nature would reestablish the population in twice the length of time it now takes.

Dr. TAYLOR. I think that is correct, yes.

I will finish commenting on Muller's statement. Muller has estimated that about the maximum increase in genetic damage that the nation or the world could tolerate would be about a 25 percent increase rather than a doubling that I mentioned. This would mean then an average exposure for the whole country of say 20 roentgens. The difficulty is this, that if you produced gentic damage in a large number of people and this is transmitted down to subsequent generations and the people interbreed, this becomes scrambled throughout the whole population picture. In order to keep our present, what they call genetic, balance, this would put too heavy a burden on those people who have not been exposed.

By too heavy a burden I mean a burden of producing offspring that have not been subjected to this damage. This would be more than the population could tolerate in his opinion. I should hasten to add at this point that the geneticists themselves do not agree on these points. There is wide variation.

Mr. HOLIFIELD. Dr. Muller has a very high standing in the scientific fraternity?

Dr. TAYLOR. Yes, sir.

Mr. HOLIFIELD. There was recently an article in the Evening Star by Dr. George W. Beadle of the California Institute of Technology in which he says that in case of exposure to radiation by the population—and he talks of an exposure in terms of 15 radiation units per year, he does not make quite plain what each unit is, so that would be something that we would have to find out.

Dr. TAYLOR. This is roentgens, I believe.

Mr. HOLIFIELD. I wondered why he used the word units in the use of roentgen.

Dr. TAYLOR. Probably to avoid a large sounding name.

Mr. HOLIFIELD. If he is using that, he would mean a constant exposure of 15 roentgens for a year rather than an accumulative, because——

Dr. TAYLOR. Yes, this is right. This 15 roentgens a year that he mentions is our present permissible occupational exposure, that is three-tenths of a roentgen per year for 50 weeks. That is where it comes from.

Mr. HOLIFIELD. This quote from his statement said, "That many deaths would result, would occur as a result of such mutations and there will be many stillbirths. Those who succeed in being born alive are quite likely to be physical weaklings or social misfits who will never marry. The fact remains that others will reduce the efficiency of individuals only slightly in ways which will not be obvious."

In this hazard which we are facing we should not only consider the hazard of blast and thermal damage of these weapons, this radioactivity introduces a threat and a danger and a hazard such as never has been introduced in the world before.

Dr. TAYLOR. This is certainly correct.

Mr. HOLIFIELD. And does this not make the element of shelter for the population almost a vital element in any type of civil defense planning?

Dr. TAYLOR. Shelter of some kind has to be provided somewhere.

Mr. HOLIFIELD. In other words we cannot withstand as a nation a mass nuclear attack on 50 or 60 of our cities even though we would withstand the blast and the heat, we cannot withstand, we cannot sustain, without serious damage, the genetic effect on future generations.

Dr. TAYLOR. I think this is correct, yes. I was coming to that point a bit later.

Mr. HOLIFIELD. Maybe we have disturbed the order of your presentation.

Mr. FASCELL. May I clear up one point before we leave that?

Mr. HOLIFIELD. Yes; then we will go back to the regular presentation you planned.

Mr. FASCELL. In that statement, do you distinguish shelter from cover? We are not talking about a house as such.

Dr. TAYLOR. Cover is to provide shelter of a sort by getting distance between you and the source of radioactive material. Distance is a help too.

Mr. FASCELL. To be specific, the necessity of shelter would be more than just a house?

Dr. TAYLOR. Oh, yes.

Mr. FASCELL. In other words, it would be, for example, an underground shelter which would—there might be others but I am using that as an example.

Dr. TAYLOR. You will need both. It depends on where your people are going to be located with respect to where you expect the blast or the burst. For those that cannot get away or are going to be in an area of heavy fallout, you will need heavy shelter.

Mr. HOLIFIELD. We use the word "shelter" in this sense not as a shelter from the weather, but shelter from gamma rays.

Dr. TAYLOR. Shelter from gamma rays.

Mr. HOLIFIELD. And neutrons.

Dr. TAYLOR. Not neutrons. You don't need to worry about neutrons. A shelter from gamma rays, which will keep the material away from you, put distance between you and where the material can stop, for example, the roof of the house and the basement.

Just distance is important to you, for example.

Mr. ECKHART. One of the subcommittees of the national committee for radiation protection issued a report entitled, "Permissible Dose From External Sources of Ionizing Radiation."

Dr. Muller was a member of this committee and there are two pages on genetic effects that pretty much summarize what we are talking about. I wonder if the subcommittee would like to have this incorporated in the record at this point?

Mr. HOLIFIELD. I think it would be good. It comes from a reliable source.

Dr. TAYLOR. Yes.

Mr. HOLIFIELD. Without objection it will be received at this point and you may go ahead, sir, with your regular presentation.

Mr. ECKHART. This has been approved by the national committee, issued September 24, 1954:

GENETIC EFFECTS

Ionizing radiations are capable of producing changes in individual genes and chromosomes in all nucleated body cells. The subsequent manifestations of these primary effects (when sufficiently marked) are generally deleterious to the individual in his lifetime and to future generations when they occur in the germ cells. It has been shown experimentally that genetic changes can be produced with low doses of radiation.

The frequency of occurrence increases linearly with the dose in the case of gene mutations and is independent of the duration of the exposure. In the case of chromosome breaks with subsequent abnormal union of some fragments (e. g., translocation) the frequency of occurrence depends also on the dosage rate, within certain limits.

It is evident that whether an individual is particularly susceptible or not, some injury of this type is unavoidable. Some cells in his body, including some germ cells, will be genetically altered. However, genetic changes of the same kind occur spontaneously and one is not dealing with a mysterious injury of an entirely new type. The main point is to control exposure in such a way that the eventual manifestation of genetic injury is not too large in comparison with the occurrence of spontaneous genetic abnormalities.

Insofar as the welfare of the race is concerned, i. e., future generations, gene mutations with inconspicuous manifestations play the most important part. The controlling factor is then the number of undesirable genes, both spontaneous and radiation-induced ones, present in the general population in which intermarriage occurs.

It is, therefore, immaterial in this caes whether in one generation the undesirable genes are present largely in a few individuals or are distributed throughout the population in correspondingly smaller number per individual.

Accordingly, the amount of radiation received by the gonads of one individual up to the time of conception of the last child in his family, can be very large without noticeably damaging the population as a whole—provided that only a very small fraction of the whole population is exposed to this extent.

Under present conditions and for some time to come, genetic damage to the population as a whole in future generations is not a limiting factor in setting up a permissible level for occupational exposure to ionizing radiation.

For other reasons the level must be considerably lower than might be set on the above grounds. However, it is well to bear in mind that this factor assumes greater importance as the percentage of the population exposed to radiation increases.

Moreover, it should be realized that any amount of radiation received by the gonads of even a few individuals before the end of their reproductive period is likely to add to the number of undesirable genes present in the population. While the majority of these genes may have no recognizable effects for a number of generations, practically all are potentially bound to result eventually in undesirable conditions.

Considering now genetic damage manifestable in the lifetime of the individual or in the first generation offspring, it is obviously necessary to limit the exposure of every individual.

Chromosomal damage in somatic cells may be responsible, at least in part, for radiation injuries that become evident in the lifetime of the exposed individual. Very little is known about this (which in essence has to do wth the mechanism of the action of radiation), but a great deal is known about the observable effects themselves.

For purposes of protection it is sufficient to choose a level of exposure that will effectively prevent the occurrence of the injurious effects no matter how they are produced. Genetic changes manifestable in the first-generation offspring are of concern to the exposed individual, since his well-being depends in no small degree on psychological factors in his family life.

Sterility, stillbirths, and abnormal children may be produced by overexposure to radiation.

Most of the information on these effects has been obtained from animal experiments, but it may be taken for granted that the same effects occur in man.

However, practical experience indicates that undesirable effects of this nature, if present, have not been so marked as to attract attention, in the case of radiologists and technicians who have been occupationally exposed to radiation—sometimes excessively, as shown by other more obvious injuries. It should be noted in this connection that sterility, stillbirths, and abnormal children occur in nature spontaneously or for reasons in which exposure to radiation plays no part. In any particular instance, it is therefore extremely difficult to attribute any such effect to radiation.

Dr. TAYLOR. I think I should point out that the individuals who make up these committees and its subcommittees I think are regarded as the outstanding experts in the field in this country and many of them are international experts so that I think there is no question of reliability.

Mr. HOLIFIELD. Thank you, Dr. Taylor.

Dr. TAYLOR. The new levels that I mentioned were first proposed in about 1947 and adopted in 1948 or 1949 have been followed religiously by the AEC in its operations. They are being adopted by the States in State regulations and in 1950 they were presented to the international commission and the American proposals were adopted internationally in 1950.

Some of these numbers are going to be up for consideration at the meetings I am going to in Geneva next week. Another problem that the committee is considering on which we do not yet have a report has to do with the permissible exposures to individuals under emergency conditions.

This relates primarily to civil defense workers and populations that are exposed to radiation under civil disaster and such conditions. I think you have a copy—I have some more copies of that with me that I can leave with you if you wish. We have an internal report on this subject that has not yet been approved by the committee. It certainly is subject to some change, but it gives some guide as to our direction of thinking on the subject and I will come to that a little bit later.

The recommendations of this committee are put out in the form of handbooks of which you see a number there. They are published by the Government Printing Office and I don't know the exact number that have been sold to the public through the Printing Office but I

guess it is in the order of 3 or 4 hundred thousand since the committee has been in operation.

A couple of these reports have been adopted by the Air Force as their doctrine in protection and incorporated into their Air Force manuals. And at the present time—I will come to this a little later—we have at the Bureau of Standards a contract with the Federal Civil Defense Administration to study this problem further and too in more detail and make recommendations to them. This is being worked on actively at the present time.

The next item, if there are no further questions on this——

Mr. BALWAN. Do you have any contracts with the Public Health Service, of HEW?

Dr. TAYLOR. No, we do not. We have very close working relations with them. They are represented on this particular committee and they know pretty well what we are doing and we know pretty well what they are doing, but we have no actual contracts with them.

Mr. BALWAN. Are any members of your committee officials of the Federal Civil Defense Administration?

Dr. TAYLOR. Yes, Dr. E. G. Williams, I am not sure of his exact position with FCDA, has been been a member of our committee since 1946 before he went to FCDA. He is a member of our executive committee and he is a member of the subcommittee dealing with this emergency exposure problem.

Mr. BALWAN. Is he there in his own right or as a representative sent to you by FCDA to represent that organization?

Dr. TAYLOR. No. He is a Public Health Service officer and he is officially a representative of the Public Health Service. We have no official representative of FCDA on the committee.

Mr. BALWAN. Is he an employee of the Public Health Service assigned to FCDA?

Dr. TAYLOR. That's right, he is a commissioned officer in the Public Health Service.

Mr. BALWAN. Thank you.

Dr. TAYLOR. He is a medical doctor and specializes in the radiological field.

Mr. BALWAN. Has FCDA asked for representation in any way on the committee or is this not the type of committee where they ask for representation?

Dr. TAYLOR. Yes, organizations do ask, and depending upon the nature of the organization, the committee passes on the matter positively or negatively. Just for example, for a number of years we had requests from the Department of Labor for representation. The policy of the committee is that it is a technical committee and there are on it only people who are substantially technical, and have knowledge in the field of radiation. The Department of Labor for many years did not have on its entire staff people who were experts in radiation and consequently they were not represented.

They are now represented through one of their outside national organizations where they do have people of technical competence so they are now represented on the committee.

Mr. BALWAN. Does FCDA have such a person in their own employ?

Dr. TAYLOR. Well, they have Williams who is assigned to them. They have a Jack Green who is with the AEC instruments branch

who knows a good deal about radiation. He is perhaps a little more of an instrument man than a physicist of broad knowledge. Aside from that I don't know of any.

Mr. BALWAN. I am seeking merely an opinion here. In your opinion is it necessary to have such people in an organization such as FCDA, which is advisory to a large group of cities and States?

Dr. TAYLOR. I think it would be highly desirable, but also they face an almost impossible task at the present time of getting people of the caliber that they would require into this work. It is hard enough to get anybody to work for the Government in this field, there is such demand for them elsewhere. One, is because of the demand, two, it is because of the salary, and three, because of the nature of the work itself. It is not likely to be of a person's choice. FCDA is one step further removed on this, because it is just plain difficult with so many opportunities open to radiation physicists to attract a man into an organization where he is going to be more or less by himself, where he will not have laboratory facilities, where his work is more of an administrative and advisory nature. You can hardly bribe people to take a job like that.

Mr. HOLIFIELD. Can persons other than physicists, but with general scientific knowledge utilize the information from studies such as yours and other physics laboratories and scientific sources?

Dr. TAYLOR. A well-trained radiologist who must pass some physics examinations to be an accredited radiologist might do this. But I could count those people on the fingers of one hand, that exist in this country at the present time.

I don't think you can avoid physics to save your life in this. You may not have to be a physicist but you have to know a lot of physics.

Mr. HOLIFIELD. So we are faced with a situation where if the people are going to have the protection which they should have in the field of civilian defense, we are faced with a situation where whether it be from lack of those people or from the lack of ability to pay salaries to obtain those people, we are faced with a gap in the protection to the people by not having these posts filled in Federal civilian defense. Is that a fair statement?

Dr. TAYLOR. I think that is right. Actually and this is the next point I was going to come to. In the work which we are doing now for FCDA, we are trying at the Bureau of Standards to fill this radiation gap for the Federal Civil Defense Administration.

Mr. HOLIFIELD. I was going to ask you what are the three main things you are doing for FCDA under the contract with them?

Dr. TAYLOR. Suppose I go through briefly what we are doing for them.

Mr. HOLIFIELD. All right.

Dr. TAYLOR. For the past 3 or 4 or possibly 5 years, at a rather low level of activity, we have been carrying out for them studies of instrument evaluation. Any instrument that the FCDA is buying for radiation measurement and protection purposes is sent to our lab for evaluation and study and we work with them on specifications and things of that sort.

Mr. BALWAN. You mentioned at a low level. Will you explain what you mean by low level?

Dr. TAYLOR. Low activity level. When this first started FCDA funds were such that they could not afford to spend more than $5,000 a year on this work. When you take into consideration operation expenses and so on, this is one-third of a man. At the same time this was going on we were doing a similar job for the Department of Defense, Army, Navy and Air Force and the AEC.

They were confronted with problems closely related to those of civil defense. For several years the civil defense work was in essence carried along with these other problems so while they only contributed a third of a man, they were probably getting the equivalent of a man and a half or two-man effort back again, because we were supplying them with some of the same information that we were supplying to these other agencies.

Mr. BALWAN. Is that an inadequate level of work?

Dr. TAYLOR. Oh, yes, that has been stepped up recently as funds have become more available to them. I am not sure I know the exact level at the present time. Next year it is to be increased rather sharply.

We have a new program that was just undertaken beginning about the first of February this year for FCDA. This program is being activated stepwise. It is being done at a very modest level for the remainder of this fiscal year.

It is going to be multiplied by 3 next year and in the following year, it will be multiplied by about 2 again and this will get up to a total of about a 6-man effort in the general field of radiation protection and measurement and instrumentation. The reason we are doing it stepwise is because we cannot get the effort from the outside to put on this and so we don't want to take their money and not give them something back for it.

Mr. RIEHLMAN. Mr. Chairman, if FCDA had the funds, would they be able to get the men that are capable in this field to secure this information?

Dr. TAYLOR. I think there is a psychological barrier to FCDA getting the caliber of people working in this field. Does that answer your question?

Mr. RIEHLMAN. It is a poor word to use, but possibly they could farm it out to your group of people to do the work. Would you be able to get the people if they had the funds?

Dr. TAYLOR. This is essentially what is happening. And what we have done right at the present time is to pull people off other work that is also probably important work but we feel is not quite as pressing as the civil-defense problem. We have pulled off a half dozen of the very best people we have and these are awfully good people who are now working in a concentrated way on this problem.

Mr. RIEHLMAN. You make a very important statement, I think, when you say there is a psychological effect on people not wanting to go to FCDA.

Dr. TAYLOR. As I said before, there is a psychological barrier in just working for the Government, a scientist working for the Government, because he can do so much better for himself financially outside the Government. This is one factor.

Second, he would prefer to work in an organization where he is surrounded by people that he can talk over his problems with at a high level. So to put 1 or 2 physicists or other highly technical people into

an organization where they will be more or less isolated, presents a very difficult problem and one which people just are not likely to accept when there are so many other opportunities available.

Mr. HOLIFIELD. This is such an important field though from the possibly lethal effects upon so many millions of our people that it seems to me that wherever the work could best be done, whether it is under contract or whether it is in Atomic Energy Commission or in the Bureau of Standards or wherever it could be done, it seems that it should be done. Because of this very tremendous lethal effect on not only generations but future generations, the genetic effect, and so forth.

It seems to me this is a tremendous field, that there is a wide gap in it and that there should be more activity in it.

Dr. TAYLOR. I agree with you. As I said before, I think this is being started, it is being done to a certain extent at the present time. In our division at the Bureau of Standards, I have personally been a strong advocate for strong civil defense for a great many years and I have been able to persuade some of our best people to drop the work that they really love, and are really interested in, to work on some things for which there is no such tangible personal benefit as there is from the other research in which they are engaged.

We are doing this now and I am sure that these men will continue to do this, so long as they feel there is a national need and that what they are doing is being received.

There is every evidence from FCDA at the present time that the work will be received well and I am sure the men will keep on with it.

Mrs. GRIFFITHS. You have put emphasis upon civil-defense work. If FCDA were to withdraw additional money with which they are buying bandages and pills and something and gave it to you, do you have people available so you could utilize that money or not?

Dr. TAYLOR. This is not too much a question of money at the present time. They offered us this year more money than we felt we could use for the next 6 months and we geared our program to what we could do between now and June. Next year it is geared to the higher level. We will continue to use some of our present people and we are in the meantime trying to recruit new people into our organization who will make this full time and let some of the other people go back to the work they were working on originally. We are sort of putting our thumb in the gap in the meantime.

Mr. HOLIFIELD. In addition to the determination of radiation exposure and the evaluation of radiation monitoring instruments, you have done something in the field of evaluating shelter materials, building materials?

Dr. TAYLOR. From the point of view of the shielding they offer against radiation, yes.

Mr. HOLIFIELD. Could you give the committee some information on that?

Dr. TAYLOR. Yes. How would it be if I went through this actual program, because that is one of the items in it?

Mr. HOLIFIELD. All right.

Dr. TAYLOR. Let me say in just passing quickly that one of the operations that FCDA wanted to step up was this committee activity that I mentioned earlier on permissible exposure for emergency workers. So that activity is being stepped up. The next item they wanted our

help on had to do with shelter evaluation and the shielding properties of materials. We are approaching this problem from 2 directions, 1 is by theory or calculation and 1 is by experiment.

Some of the work is not amenable to easy experiment and so one has to use calculation. You develop a theory for the calculations and you test it in the lab and if it proves out all right you use it from there on.

At the present time we are doing what we call a quick and dirty job for them. This has to do with determining the amount of shelter that would be afforded by existing buildings, homes, apartments, and office buildings and so on, against fallout radiation. This is to obtain some idea as to how much protection from radiation can be obtained if people simply take cover wherever they can. This information will be fed into this large systems analysis project that FCDA has underway with the University of California. They are analyzing a large city situation where they have to determine the effect of existing structures on the shelter problem. We are supplying them with the technical radiation information on this subject.

On a longer range basis that we expect to extend for at least several years, we are going into this in greater detail and making a more critical evaluation of the information and we hope to put this in a form such that FCDA or ourselves can put it out to the public in a way that the public can determine something about their shelter availability, shelter needs.

Mr. HOLIFIELD. Does that include special adaptations of cellars, of existing homes. possible modifications within homes?

Dr. TAYLOR. The later work will include possible modification of homes, the first stage will consist primarily in evaluating what can be had in existing homes without any changes.

If you live, for example, in a 2-story house with a basement you go to the basement and your roof is 25 feet away from where you are in the basement and you're shielded by so much earth from the side, you will have a certain kind of a technique. If you have a slab type construction, 1-story rambler, there is no basement to go to; the farthest you can get away from fallout on the roof is maybe 10 feet; your problem is something different. That is a plug for the old-fashioned house with a basement.

Mr. RIEHLMAN. Getting back to the subject of the lack of scientists in this field Doctor, in view of the statements you made that very few would be attracted to go to civil defense, don't you feel it would be unwise for them to endeavor to get any of them, or if they have the services of at least one man that he will be duplicating the work that you people are carrying on, and it would be unwise for them to carry on any lab program of any kind in Federal civil defense?

Dr. TAYLOR. Civil defense should certainly in my opinion not attempt to get into the lab program. Take our radiation lab facilities at the Bureau. I would guess at today's prices it would probably cost $3 or $4 million, maybe more to duplicate them.

Mr. RIEHLMAN. Why would they need the services of too many people other than to evaluate the information that you are passing on to them?

Dr. TAYLOR. That would be their principal need.

Mr. RIEHLMAN. How many people would they need in that field?

Dr. TAYLOR. One or two fairly good people could take care of their needs.

Mr. RIEHLMAN. To get back to your own activities in the Bureau of Standards, if you were able to secure more of these people that you have been talking about, scientists and so forth, actually to what type of work would you put them?

Dr. TAYLOR. We would step up immediately, if we could, the experimental approach to this shelter problem for existing buildings where we would simulate radioactive fallout.

Mr. RIEHLMAN. What do you mean if you could?

Dr. TAYLOR. We don't have the staff to do this at the present time.

Mr. RIEHLMAN. And you can't get them?

Dr. TAYLOR. That's right.

Mr. RIEHLMAN. I thought you were putting the emphasis on if you could, if you could get the scientists, is that what you mean?

Dr. TAYLOR. If we had the scientists available right now, we would be doing this. We are doing this particular phase of the problem in a very small way. We expect to be able to get the people to do this within the next few months. In the meantime we are preparing the groundwork for this by using people that have been engaged in other projects.

Mr. RIEHLMAN. Would that be the only type of activity that you would use them for?

Dr. TAYLOR. No. We would increase our effort in the instrumentation program.

Mr. RIEHLMAN. In connection with this type of instrument?

Dr. TAYLOR. In connection with this. And we are planning to as a matter of fact study the application of some of the new techniques that might be applied to instrument design. We expect as a matter of fact to be able to start this around the first of July. I would say that we will be able at the Bureau to get the staff to do this. In our radiation lab at the Bureau we have something in the order of 75 people. We have some very outstanding people, of both international and national reputation, people so devoted to their work that they are willing to work for the Government in spite of other obstacles.

Mr. HOLIFIELD. At a lower salary?

Dr. TAYLOR. Yes, there are many things about Government work that the people like and they are willing to accept the lower salaries to do this. I am not running the Government down, don't misunderstand me.

Mr. RIEHLMAN. As long as you are on the salary question, is the salary you people are able to offer a factor?

Dr. TAYLOR. Very much so, yes. I will give you an example of about 3 years or so ago when we were trying to find a chief for one of our sections. This was to be a section chief. We offered this job or explored the job with a half dozen people. They all were earning at that time more than our director.

Mr. HOLIFIELD. Will you give us in terms of dollars what these men were working for in outside industry and what you were able to offer them?

Dr. TAYLOR. Well, we would be willing—let me take this one specific case. We were willing to offer up to a GS–14.

Mr. HOLIFIELD. Which means what?

Dr. TAYLOR. I am not to sure. That is around $11,000.

Mr. RIEHLMAN. Eleven or twelve thousand dollars?

Dr. TAYLOR. A little over $10,000. I am not so sure what that is at the present time. Very mediocre people in radiological physics,

maybe working with hospitals, medical institutions, other labs, are earning $12 to $15,000. People that we would not consider paying more than, on our present standards, more than maybe $8 or $9,000.

Mr. RIEHLMAN. You mean because of their background, because of their ability or because of your being able to pay them?

Dr. TAYLOR. No, because in comparison with the people that we are already paying that to, in order to keep some semblance of structure in the organization. We couldn't afford to bring that man at $12,000 and put him alongside of another man who is much better than he is who is earning only $9,000. If we were to boost our upper grades of people, GS–13 grades on up, into positions that were competitive with the outside, they would all be getting salaries comparable to our director's salary.

Mr. HOLIFIELD. Which is how much?

Dr. TAYLOR. $14,800.

Mr. BALWAN. Is that under a special statutory provision?

Mr. FASCELL. Yes, it is under the Classification Act, under which everything has to be compressed under the top of 14–8.

Mrs. GRIFFITHS. Why don't we raise that?

Mr. FASCELL. We have been trying to for a long time.

Mr. RIEHLMAN. Were you going to elaborate any more on what you were going to use these people for other than the continuation of this type of program and the development of these types of instruments and for protection through shelter and so forth?

Dr. TAYLOR. Those are the principal things. We also have from FCDA under this contract arrangement, the directive, if you would call it that, to study all phases of radiation which we feel are necessary to the civil defense problem. In other words we are put in the position of evaluating what we feel is needed and what we should study on.

And this is a desirable sort of an arrangement because we have a considerable number of people who are very knowledgeable in this whole field and through their knowledge of radiation are probably in a much better position to know what needs to be done than many of the people in Civil Defense who are not as familiar with radiation as our group would be.

This is not critical of Civil Defense, they simply don't have the people and they are experts in other directions.

Mr. RIEHLMAN. I thought you said they only have one that is a specialist in radiation.

Dr. TAYLOR. They have only one that I know of. His specialty is a little bit more in the instrumentation than in the broad overall knowledge.

Mr. RIEHLMAN. Yes.

Dr. TAYLOR. He does know enough about it so we can discuss the problems intelligently and he knows when to give us a clear field. This is very important.

Mr. HOLIFIELD. I know something about the work along this line that is being done by the Atomic Energy Commission and we know something about the Naval Laboratory work out on the coast. There may be additional work being done by other agencies of Government and the question that I want to ask you is based on this. How much duplication of the work of the Bureau of Standards is occurring at this time in other agencies of Government which may contribute to this shortage of physicists?

Dr. TAYLOR. Not a great deal.

Mr. HOLIFIELD. You feel that the work of the Naval Laboratory out at San Francisco is a different type of work than that which you are doing in the Bureau of Standards?

Dr. TAYLOR. They are doing some things which are closely related to our work. They are doing some things there at our suggestion where the problems were a little bit more closely related to naval problems than to basic problems affecting all areas of interest.

They are concerned—and this you must take as second-hand knowledge—they are concerned with problems of biological effects of radiation, protection of individuals on shipboard and in Navy installations, decontamination, problems of that sort. We are concerned, in contrast, with developing basic understanding of the properties of radiation, its penetration and diffusion in matter. One of the men in our lab who incidentally has won a Rockefeller fellowship to go abroad next year has developed a theory for radiation penetration and diffusion in massive barriers that has now been accepted internationally. It is one of the real breakthroughs in the approach to this problem. In the instrument field, the Signal Corps labs in New Jersey are doing some work that is related to ours. We started to do the work and they have developed a lab since then. Their work is a bit more slanted toward the testing of instruments coming off the production line you might say. But they are also doing some work which is not too distantly removed from ours.

Mr. HOLIFIELD. Then generally you could assure the committee that there isn't a wide duplication of effort in specific fields, but that in these other major activities such as the Navy activity there on the coast that it is complementary work and there is an exchange of information or a coordination of this information for the common good.

Dr. TAYLOR. By and large I think this is correct. I don't think that there is any very serious overlapping or duplication of effort or facilities. This of course may be spotty at times.

You can't help this where you have people who think independently about problems. But by and large I dont' think the problem is too serious at the present time.

We do make—and this is to a considerable extent on our initiative—we do make considerable effort to try to bring together the efforts of these laboratories, although this is being done quite unofficially at the present time. I think the Bureau probably has the largest group of what you might call uncommitted radiological physicists of any of the laboratories in the country. We have people who are not committed to solving specific problems to which you have to have the answer by the next morning.

Mr. HOLIFIELD. Their work is mostly basic research and experimentation.

Dr. TAYLOR. The Bureau's work.

Mr. HOLIFIELD. The Bureau's work.

Dr. TAYLOR. That is right.

Mr. HOLIFIELD. While in the Naval Laboratory there is an urge for immediate application to certain problems which they have.

Dr. TAYLOR. It is much more applied although they are doing certain basic work in related fields.

Mr. HOLIFIELD. All right. You may proceed on your schedule there.

Dr. TAYLOR. I think as a matter of fact in the course of your questions and answers I have covered most of the problems that we are working on now for Civil Defense at the Bureau. We are putting the main emphasis at the present time on these first 2 problems: 1, the shelter evaluation; and 2, the work of the committee on exposures under emergency conditions. The other programs will be stepped up beginning the next fiscal year.

It seems too that we have somewhat gone into my next item which was a rather quick review of the Bureau's program in radiation physics.

Basically our problem at the Bureau has to do with standards and we have developed and maintained standards for X-rays and for radiations from radioactive materials and for all of the radiations that are normally involved, namely alpha, beta, gamma rays and neutrons. We have accelerators that can produce radiations of energy up to 180 million volts and we are working on the standards of measurement that are involved in this very high energy region.

Along with this our general program consists of the calibration and evaluation of the meters and instruments of all kinds used for measuring the dose that is delivered by these different kinds of radiation.

In addition to that, just to mention a couple of items, we calibrate all of the radium that is used for medical purposes in the country and this relates back again to problems involved in the military and civil defense. We calibrate radioactive sources that are in turn used by the military services for calibrating their instruments in the field.

And on one of the projects that I see that I skipped, we are expecting to develop a similar type of calibrating system to be used by Civil Defense out in the States so they can check on their instruments. This incidentally is a very serious problem at the present time, because a State may have 20 or 30 instruments, but not have any means at hand to determine whether these instruments are reading correctly or not.

Civil Defense is quite aware of this and we are going to try to help them out.

The next broad problem has to do with the problems of radiation protection and here again we cover all types of radiation and the whole energy range from a few thousand volts up to 180 million volts.

In this connection we have made the necessary basic studies to determine the shielding characteristics of materials, like lead, concrete, steel, earth and so on. Having this information we have developed numerous studies on how to apply this to specific problems of shielding. This may be for reactors or it may be for buildings. It may be for medical installations and so on.

At the same time we are constantly engaged in problems of instrumentation and, as we uncover any new ideas having to do with instrumentation, these are fed into the general mill of radiological instrumentation.

Then the other rather large field that we are working in has to do with the general properties of radiation, and these I have already touched on. These have to do with the interaction of radiation in matter, the way it is scattered, the way it is absorbed, the way some radiation produces in turn a different kind of radiation. We are also studying the general problem of how to measure the energies of the radiations that are involved. This is a rather tough problem, incidentally.

I think I am safe in saying that even today we don't have a good technique for determining the energy of the radiation that is given off by fallout material. We have some rough ideas as to what it is but they are not good enough at the present time for some of our needs.

Mr. HOLIFIELD. But they are good enough that, from a protection standpoint, we do have instruments that will detect and inform the monitor that he is in a danger area, that it is to the point of danger.

Dr. TAYLOR. That's right; yes. We do have this.

Mr. HOLIFIELD. As a matter of fact, in the development of these monitoring devices—and I suppose you are getting to that next—I hope you will give us some idea of the practicability of these items, take them up one at a time, tell us about what they cost and how trouble free they are or whether they are instruments that require frequent calibration, and give us a general idea of these instruments which you have brought here this morning.

Dr. TAYLOR. Yes; I was planning to do that. I was going to precede that—maybe you have this background already—with this very brief discussion of the characteristics of radiation, because the radiation characteristics influence the instruments of your choice.

Mr. HOLIFIELD. You go ahead in your own order.

Dr. TAYLOR. Well, you have, as I am sure you know, several types of radiation. You have X-rays or gamma rays, which are essentially the same. They are electromagnetic in nature. They are similar to light except that they have some additional properties dependent upon their energy or their short wavelength. These are very penetrating radiations. These would go through wood and glass and steel and lead and so on in varying degrees. Then you have beta rays and electrons. Beta rays are produced naturally and electrons are produced artificially.

These are negatively charged particles and the penetrating power of these is quite small. The highest energy electron we normally produce in the lab, 30 million volts or so, will only go some 5 or 6 inches into body tissue and a very short distance into concrete or steel.

Most of the energies we are concerned with in nuclear warfare are low enough so that the beta rays are absorbed by almost anything; some of them by clothing, some by an eighth of an inch of glass or something like that.

Then you have alpha rays that are positively charged articles, and these are very short range indeed. They will only go a few inches in air.

Then you have neutrons, that are particles again that have no charge. These can travel very great distances and the shielding against them is quite a different problem from that against any of the other radiations.

For example, going back to gamma rays, the ideal shield would be a heavy atomic number material such as lead, tungsten, gold or platinum. For practical purposes lead is the one you would use. About a little less than a half inch of lead will reduce a gamma ray beam to half of its strength in passing through. If you put two half inches of lead together you will reduce it a half again and so on.

Mr. HOLIFIELD. Will you give us the comparison for a common building element such as brick or concrete?

Dr. TAYLOR. For concrete, I believe the thickness necessary to reduce the radiation by half is about 4 inches.

Mr. HOLIFIELD. In the atomic plants they have shielding in many instances up to 5 feet of concrete and laminated steel concrete up to 5 feet.

Dr. TAYLOR. Yes. We have in our own lab at the Bureau concrete walls made up partly of concrete and partly of concrete blocks up to 5 feet. We have one 8 feet thick. In one area in addition to that we put in 12 or 18 inches of lead in order to save space.

Mr. HOLIFIELD. From a practical standpoint, then, in building shelter against either gamma rays or neutrons, it is an impossible task within the limits of the fireball, assuming a burst such as the 1954 burst—we have had that described by Dr. Libby before us which had a 3½-mile fireball and within a period, within a distance of 6 or 7 miles from the outside of the fireball or 10 miles from the center of the fireball, it would be almost impossible to protect human beings with normal building materials from gamma rays; would it not?

Dr. TAYLOR. No; I don't think that is quite the problem. I think you could protect from gamma rays but you could not protect against the pressures that are involved. If I could withstand the pressure, 8 miles away, say, where I live right now with respect to the center of Washington, and if I could get 3 feet of concrete over my head and not be killed from the blast, I would just as soon ride it out right there. That close, the blast is the thing that will probably do you in.

Mr. HOLIFIELD. So you are faced with the blast damage within a 10-mile radius and we are thinking now in terms of a 10-megaton bomb but, beyond that, the people who are in basements—ordinary basements—would they be exposed to radioactivity of a lethal nature?

Dr. TAYLOR. Let's distinguish between two sources. One is the source from the explosion itself.

Mr. HOLIFIELD. Yes.

Dr. TAYLOR. And then next is the fallout.

Mr. HOLIFIELD. Fallout?

Dr. TAYLOR. Fallout, from the explosion itself; I think that, in any region where you can provide shelter against blast, you can provide shelter against radiation. I would certainly trust myself that way on the basis of what I know about it today.

Mr. HOLIFIELD. On the basis of your studies, may I ask this question, which I am sure has a practical interest: Would you prefer to depend upon shelter rather than evacuation?

Dr. TAYLOR. That is the $64,000 question, I am afraid.

Mr. HOLIFIELD. Well, I am taking into consideration the fact that warning periods for great urban centers may be less than 3 hours at the present time, and taking into consideration the difficulty for evacuation of, say, a million people from Chicago or New York or Los Angeles.

Dr. TAYLOR. This is purely a personal opinion that I am expressing now. My own feeling is that at our present state of planning and the present state of our communication routes from cities, that the problem of evacuation is going to be such that within a very short time the whole business will bog down on the periphery. Something has to be done to plan our way around that, I am sure. I am sure it is being worked on. If my home were as far out as 12 miles or so,—I would build myself a good shelter and try to get in there and stay there. That is what I would do personally.

Mr. HOLIFIELD. When you consider the problems of feeding and sheltering a million people who have been evacuated, the disruption of processes of industrial production and that sort of thing, shelter at this time seems to offer the best way out, does it not?

Dr. TAYLOR. You are taking me a little afield of my professional activity here.

Mr. HOLIFIELD. You have a great deal of professional knowledge and information and I may be taking you out of that particular field, but I am certainly taking you into a field where commonsense and judgment based on the information you have, I believe would be valuable to this committee.

Dr. TAYLOR. I think personally that a combination of shelter and evacuation is probably the long range answer and these two things have to be integrated and have to be considered for each individual city situation that you have. I don't think it would be economically feasible to provide enough peripheral shelter to take care of the city of Washington for example. You can provide a little or so, maybe more than just a little. The next best bet is to get as far away from things as you can. Whether you go into a fall out area or not, is in the lap of the gods. If you get into one you have to try to get out of it, or you have to take what shelter you can there. I think that an evaluation of the shelter possibilities in existing structures will provide some of the answers to this and this is the sort of an answer that the University of California—FCDA contract is trying to work out.

Mr. HOLIFIELD. In your study of the general penetrability of materials has it been valuable in, has it reached a point of practical application in the field of building shelters which would be considered reasonable and protective to the point where you could estimate the cost to the person for the building of such shelters?

Dr. TAYLOR. We certainly have available today the basic information that is necessary to determine how much shelter material you need. When you come down to problems of cost and feasibility, I am not in a position to answer. I am sure the engineers could work this out.

Mr. HOLIFIELD. Do you know of any study that is being made by any reputable group that we could call before us for that type of information.

Dr. TAYLOR. Not offhand. I am sure that you could get information on that, but I don't know offhand of any group that is making a special study of that problem other than the military.

Mr. HOLIFIELD. We had heard that there has been a study made by one of the big industrial companies for the Air Force.

Dr. TAYLOR. Is Rand working on that?

Mr. HOLIFIELD. I am not sure what company it was.

Dr. TAYLOR. There is a lot of work of this sort sponsored by the military which we don't know too muc habout. I just don't offhand know just exactly where to turn for that.

Mr. HOLIFIELD. That would indicate then that the work in this field has not been very closely coordinated. If this is true that they have been making studies and your Bureau of Standards is not aware of it?

Dr. TAYLOR. Not necessarily, because our interest has to do with radiation and radiation characteristics and properties. What one does

with this in the nature of providing a protective shelter is an engineering problem and there may well be groups that we would not formally coordinate with.

Our problem is supplying the basic information, not supplying the end product.

Mr. FASCELL. I wondered if in your studies there is anything with respect to the consideration of chemicals, for example, that might be very economically added to presently known building materials that would be of any value?

Dr. TAYLOR. This can be done but it is not economically important unless you have to save space. You can add barium.

Mr. FASCELL. I was thinking of mass application of course.

Dr. TAYLOR. Let's take a barrier that in concrete would call for 2 feet of concrete. You could use a barium containing ore instead of the stone and this would cut the thickness from 2 feet to maybe 20 inches, say. The cost of doing this would be more than the cost of the 2 feet of concrete. In certain types of laboratory installations and field installations in connection with weapons tests, they use chunks of iron, bolts, nuts and so on, mixed into the concrete in place of the stone aggregate. This decreases the overall thickness but it increases the cost. If space that is taken up by the thickness is not of importance, the cheapest material is just plain concrete.

Mr. FASCELL. Then we don't have anything that could be added to an 8-inch block or a 4-inch brick that could do the job today that could be incorporated in most standard building codes?

Dr. TAYLOR. That's right.

Mr. FASCELL. How about the application of some cheap electrical item in the home which would create an opposing electrical field?

Dr. TAYLOR. There is nothing of that sort that would have any effect on radiation.

Mr. FASCELL. That we know of now?

Dr. TAYLOR. That we know of now. Everything is what we know today.

Mr. FASCELL. So far as we know we don't have anything now or that we can foresee reasonably which might be incorporated economically on a mass basis in existing structures.

Dr. TAYLOR. There is nothing more economical than concrete. The big problem in protection from radiation in the energy region we are considering is just getting a mass of material. Concrete weighs 140 to 150 pounds per cubic foot, so a cubic foot of wall would weigh 150 pounds. Earth would weigh about 100 pounds. That is about two-thirds as protective as concrete. Lead would weigh 700 pounds per cubic foot. It is five times as protective. This is for the gamma rays. For neutrons—and I don't think the neutron is a big problem so far as civil defense is concerned—a neutron will go through lead very easily. It will be stopped materially by paraffin or water or some solution containing boron depending upon the energy of the neutron. The ordinary boric acid in water makes a very good shield against some neutrons. So what is a good protection against gamma rays is not necessarily a good protection against neutrons.

Concrete is a happy medium between the two. For neutrons you want material that contains hydrogen. There is hydrogen in concrete so you get some protection there.

Lead has no hydrogen so neutrons go through almost as if it wasn't there.

Mr. HOLIFIELD. For all practical reasons we have to ignore the neutron dangers, first because it is not very important and we have the difficulty of protecting against it.

Dr. TAYLOR. The main thing to consider if you are where you will be hit by a neutron is that you will be hit by a flying brick first.

Then there are the beta rays that are not one of the dominant agents against which we have to protect ourselves. Nevertheless they may produce gamma rays when they strike something.

If a beta ray strikes a particle of material, it then produces a gamma ray, so you have a secondary process occurring that is necessary to take into consideration in your shielding.

Mr. HOLIFIELD. Isn't the life so short in the beta rays that for all practical purposes you don't have to worry a great deal about that in the case of an explosion?

Dr. TAYLOR. No, you will have a real beta ray problem in your fallout.

Mr. HOLIFIELD. Even at a distance?

Dr. TAYLOR. Oh, yes. You will have beta rays and gamma rays.

Mr. ROBACK. Isn't it, the beta-ray problem, primarily a problem of producing severe burns rather than radioactivity penetration?

Dr. TAYLOR. It will do both. Beta-ray protection can be accomplished by very little material, possibly just the clothes you have on. If a particle of radioactive material falls on your clothing, the beta-ray component of the radiation that is given off from that may be absorbed in the clothing. If the particle gets on the skin and stays on the skin, its beta radiation will be absorbed in the first layers of the skin and will be highly absorbed in the skin so that you will get considerable damage at the surface from beta rays. The gamma ray originating from the same particle will go through the skin, say through the hand, and only leave behind in the hand a certain small fraction of its energy, so in that case the gamma rays——

Mr. HOLIFIELD. But it will destroy cells as it goes through?

Dr. TAYLOR. Yes.

Mr. HOLIFIELD. Can you give us some information on the type of burn the Japanese fisherman got on the *Lucky Dragon*, was that chiefly gamma or chiefly beta?

Dr. TAYLOR. That was chiefly beta rays and the natives on the island were chiefly beta rays.

Mr. HOLIFIELD. Of course that was the reason why they said if they had changed clothes and washed the ship and washed themselves that they could have protected themselves to a great extent.

Dr. TAYLOR. Yes. Where you have fallout material it comes from above, it will get into your hair, it will get into your ear. It will get down around your neck if you have a collar and stay there long enough to produce local damage. It doesn't get into the system in the same way the gamma ray does, and the beta ray burns are, you might say, much more readily curable than the gamma ray burns, less deep seated.

Do you have some time you want to cut off, because there is a question of whether I want to discuss a shelter problem or go on to this problem of instrumentation.

Mr. HOLIFIELD. Let's have a little more on the shelter problem. Don't you think this is of enough importance to take some additional time?

Mr. FASCELL. I would like to find out whether or not we will have to put a shelter with every house.

Mr. HOLIFIELD. That's right.

Dr. TAYLOR. If I may use the blackboard for a moment. This is one of the questions one of your staff members raised with me the other day with regard to a shelter. You have here the surface of the earth and suppose you want to protect some people. For the sake of argument you make a simple igloo type of structure, a hemispherical type of structure and you have fallout.

You are going to fill this with people and you want to know what is going to happen to the people in there. As far as fallout that stops on the top is concerned, you have—here is your individual here—you have to put between the fallout and the individual a certain amount of material.

Now there is no cure for weight of material or thickness of material other than lead; there is no material by which you can make a thin structure here. So that this structure needs to be something in the order of 3 feet of concrete. Don't let anybody sell you on the idea that there is something special by which they can make this 6 inches.

You have to have thickness. You can get the thickness by using 6 inches of concrete as a shell and then piling it over with earth. Even with 3 feet of concrete there is going to be some radiation coming through and depending upon how long the people have to stay in this area they will be exposed to a certain dose; if this were a smooth concrete shell and it were possible to put a fountain of some sort at the top so as to wash this off in all directions, you could wash off this fallout material so there would be much less exposure to the individuals inside.

But suppose the fallout all accumulates all around the edges, you would have a high concentration of material there and you would get a substantial dose in that direction, so you want to take it away.

Mr. ROBACK. There wouldn't be any horizontal movement; would there?

Mr. HOLIFIELD. Of gamma rays?

Mr. ROBACK. Maybe I misunderstood Dr. Libby's testimony or someone else's but I thought these rays are vertical in their movement, they come down, never go sideways.

Dr. TAYLOR. The particles come down but the particles are what gives off the radiation in every direction, every conceivable direction, so a source, a particle at this point is giving off radiation in every possible direction. This raises one other point namely that a particle here might start off a ray in this direction and it will strike an air atom at that point and up and down and eventually get back in there by a very circuitous route.

In each of these scatterings it loses energy, and by the time it reaches here it may be so low that this will shield it. This is not always this way. For a thin shelter here even if you might wash the material off a thin shelter you will definitely have to worry about this kind of scatterings from the material around on the ground.

Mr. HOLIFIELD. If the water did wash it off and it was not carried away in gutters, you would have a concentration in the ground nearby.

Dr. TAYLOR. This is right. In some way you have to clean up this ground for a considerable area around the shelter so that the radiation has to be scattered quite a number of times before it gets this far.

You may have to add more material so it does not pay to flush it. If you cover this over with earth, you can't flush it. The material gets in there and stays. In that case you want to be sure there is enough earth in there so even if the material is fixed there, there is still adequate protection for say, 1 week occupancy of a shelter like this. At the moment we do not have good information as to what shielding one should call for in a situation of this sort. This is one of the things we are working on. We can make some fairly good estimates and they would probably be on the conservative side, which means our shelters would be less economical than they might be after we know more about it.

Mr. ECKHART. Would that configuration allow for a couple of feet of earth to be piled on top of it.

Dr. TAYLOR. This hemispherical construction here is the strongest mechanical construction you can have. It should be reinforced. There is this about it. Depending somewhat upon the construction, if this has also to withstand heavy pressures, blast, you are in some danger of collapsing the whole thing out like this, so for safety purposes this ought to have a slab base of concrete also that is monolithically tied into the top so the whole thing is a tight mechanical structure.

You can make a structure like this that will withstand enormous blast pressures.

Mr. ROBACK. The relative merits of aboveground or underground structures has only to do with blast, not with radioactivity.

Dr. TAYLOR. The economics, yes.

Mr. ROBACK. I am talking about the question of the structural properties. In other words, if you go below ground and get a lot of that earth protection——

Dr. TAYLOR. It depends on how far below you go. If you had a relatively wide flat arch here below the ground, not sticking up too prominently it would——

Mr. HOLIFIELD. The p. s. i. comes down as well as sidewise?

Dr. TAYLOR. Yes. You would have a shock front moving in this direction where you would have a high pressure in very short time. That moves along like this. At any distance where you are going to have shelters anyway, the normal variations in the contour of the earth are large compared with the structure like this, so there probably isn't a great deal of difference between this——

Mr. HOLIFIELD. Thinking in terms of an ordinary basement, I know some of the shelters out in Nevada were built in this fashion, a triangular fashion. Here would be the wall of the cellar and then there would be a heavy laminated concrete wall in a triangular fashion up against the wall of the cellar, which is reinforced by the dirt on the other side of it. Does that seem to offer a reasonable economical shelter for a family?

Dr. TAYLOR. Certainly within the regions where you don't expect to have the house completely demolished and thrown down on top of you along with a lot of rubble.

Mr. HOLIFIELD. You already have the floor, you have the wall and what you actually need now is some type of enclosure of those two factors.

Dr. TAYLOR. Yes.

If you are in a region where the entire house does not collapse on top of you, a structure like that would be very advantageous. This depends on where you are located with reference to where you expect the blast to occur. If I thought the aiming point was the center of Washington, and I was five miles from the aiming point I don't think I would bother to make a shelter like that.

Mr. HOLIFIELD. This is such a variable factor, the point zero that I think you have to take reasonable precaution everywhere in the hopes that that reasonable precaution will be effective because of the area that you happen to be in.

Dr. TAYLOR. That's right.

Mr. HOLIFIELD. Isn't this a logical way to think about it?

Dr. TAYLOR. Yes. I don't know where just one would draw a line like that in planning. I said 5 miles just pulled out of thin air. I live about 8 miles. I would be inclined to have something like that in my own home on the chance that the enemy might do some bombing as badly as we did during the last war and hit over southern Maryland instead of Washington.

Mr. FASCELL. At that point, I assume, Doctor, that at the present time you have no shelter in your home?

Dr. TAYLOR. That's right.

Mr. FASCELL. From a practical standpoint, I don't ask this to embarrass you, when would you put a shelter in your home?

Dr. TAYLOR. I have been, as a matter of fact, very seriously considering it and I have the structural members necessary to put in a shelter in my basement. I got them during the atomic bomb era, not the nuclear bomb era and I may get around to doing it.

Mr. FASCELL. Pretty quick?

Dr. TAYLOR. Some time soon. I have also been rather seriously looking over my particular situation with regard to building an underground shelter. I have a personal problem that enters this, namely that the area I live with is being encroached upon by apartments and I am thinking of trying to go someplace else. I am looking out in the direction of Potomac or Rockville or some place like that.

Mr. FASCELL. You are thinking about shelter and you have the structural members there and you feel you are giving it enough thought so in the pretty near future you intend to take action on it regardless of where you are.

Dr. TAYLOR. I will do something.

Mr. FASCELL. Do you think that is good advice for all Americans today to do the same thing?

Dr. TAYLOR. Yes.

Mr. FASCELL. Do you think it is a necessity today?

Dr. TAYLOR. Yes. I don't think you can regard this civil-defense problem as a problem and ignore that problem in your own personal life.

Mrs. GRIFFITHS. I would like to ask if this shelter would protect 5 miles away from ground zero? Do you think it would withstand the blast?

Dr. TAYLOR. I am sorry I don't know. I don't know enough about the blast problem.

Mrs. GRIFFITHS. I understand the underground shelter in Nevada had no problems at all.

Dr. TAYLOR. But in Nevada they are only talking about a few kilotons.

Mrs. GRIFFITHS. Baby bombs.

Dr. TAYLOR. Yes.

Mr. ROBACK. Are you familiar with the FCDA shelter recommendations?

Dr. TAYLOR. I have seen them. I couldn't tell you much about them.

Mr. ROBACK. Did the Bureau have anything to do with formulating those shelters?

Dr. TAYLOR. Not that I know of.

Mr. ROBACK. Have you any observations to make with regard to them?

Dr. TAYLOR. I have seen the bulletin. I don't recall enough about it at the moment to have any observations. I do recall at the time that they did not seem particularly unreasonable.

Mr. HOLIFIELD. If we can, let us go to 12:30 and we will give you time to conclude your statement and then we will have Dr. Skramstad give us a brief lecture on the computer.

Dr. TAYLOR. Right. Suppose I take then this question of the instrumentation?

Mr. HOLIFIELD. All right.

Dr. TAYLOR. Now, as I mentioned before, the type of instrumentation that is called for depends upon the situation that you are in and what you are trying to measure.

The fundamental type of instrument for measuring radiation is what is known as the ionization chamber. This is a device having various shapes and forms that consist of a cavity of some sort, a chamber, into which a small electrode is introduced and on which an electric charge is placed. When the X-rays pass through this volume, they make the air electrically conducting, that is what we call ionizing the air. This carries the charge off the rod or part and the charge carried away is measured on a sensitive instrument. That is the basis of a good deal of our instrumentation today.

With an ionization chamber you can measure gamma rays and beta rays and this is one of the typical instruments that has been developed for civil defense primarily for civil defense purposes.

The bottom part of this is the ionization chamber and the top part contains the electronics that is involved. This is calibrated—this is one of the things we would do at the NBS—is calibrated to read in roentgens. If this instrument is exposed to a radiation field, the rays pass through it, ionize the air and the charge is measured on the meter. This is a very small compact instrument and efforts are being made to get them smaller and more compact. It is also battery operated with standard batteries so you don't have a battery supply problem.

As I mentioned before beta rays are absorbed very easily by small amounts of material and most of the beta rays would be absorbed by the case of the instrument.

If you want to measure beta rays there is a shutter which lets some beta rays sneak in through these four holes. Behind those holes

are small films of cellophane which permit the beta rays to go through.

When you are measuring with the window open, you are measuring both beta rays and gamma rays and sometimes it takes a fair amount of understanding on the part of the monitor to interpret his instrument reading in terms of the fraction that is beta rays and the fraction that is gamma rays. This is part of the training that is called for in the use of these instruments.

Mr. HOLIFIELD. How trouble free is that instrument in the hands of a civilian defense monitor working on it?

Dr. TAYLOR. I can't say about this particular one. By and large they are relatively trouble free. Like any instrument, particularly an electronic instrument, one containing a sensitive meter, it can be damaged by dropping. There are mechanisms built into it for checking its sensitivity. On the other hand you might break one of the internal electrodes and the instrument would operate correctly but not read correctly.

That is why you need some calibration in the field.

Mr. HOLIFIELD. What would that sell for?

Dr. TAYLOR. I am sorry I don't know. The FCDA is buying these now in great quantities and the prices have come down enormously. They used to be $100, but I am guessing that it may be now $50 or $60. They can supply you with that information. I am not sure that we have the information in our lab. This is what is known as a survey meter.

Then you have another type of meter which is for direct measurement of radiation on the person itself. There are two types. One is a pocket instrumentation chamber. It is just a hollow type with a rod down the middle. It is placed on an instrument that puts a charge on it. This is just worn in the pocket. When it is exposed to radiation, the charge leaks off the rod and at a later time this is taken to a central point, placed on a measuring instrument and the amount of charge that has leaked off is measured and the dose is measured.

Mr. HOLIFIELD. It would be of no value to the individual as far as protection is concerned?

Dr. TAYLOR. That's right.

There is another type which is more elaborate and expensive. This employs the same principle but this has in it a small fiber electroscope; by holding it up to the light you can see the fiber and a scale like in a microscope and you can read directly on the scale the dose of radiation to which this has been exposed.

Mr. HOLIFIELD. Is this in milliroentgens or in roentgens?

Mr. BALWAN. They vary.

Dr. TAYLOR. This particular one is in roentgens. This will read up to a hundred roentgens. The military services have some that read as high as 600 roentgens.

Mr. FASCELL. Do you read this in an exposed area and get a true reading of the individual?

Dr. TAYLOR. You can read this at any time and determine how much dose you have had up to that time.

Mr. FASCELL. It is cumulative?

Dr. TAYLOR. Yes.

Mrs. GRIFFITHS. It is just like a thermometer?

Dr. TAYLOR. No, the thermometer tells you what the temperature is at the moment. It doesn't tell you what it was an hour ago. This tells you how much radiation you have been exposed to since you charged the meter.

Mr. BALWAN. Can't you determine the rate by comparative readings against time?

Dr. TAYLOR. Yes. This survey meter also measures rate. It is roentgens per hour.

Mr. BALWAN. Yes.

Mr. HOLIFIELD. This would be a very valuable type of instrument for individuals if they can afford it.

Dr. TAYLOR. I have my own.

Mrs. GRIFFITHS. What do they cost?

Dr. TAYLOR. At the time I got mine they were $16 or $18 and I made my own charger which at the time cost around $50.

I think now these things are down to something in the order of $8 or $10 and the chargers are $20.

Quantity production has brought these things down enormously in cost.

Then these two types of instruments, both ionization chambers are the type that will be most commonly used in civil defense. One will permit you to go into an unknown area and map the radiation field and the other will tell you how much you have had yourself.

Then we have the Geiger counter, of which we have a sample over here. The Geiger counter operates on the ionization principle too, except that it has a different range of sensitivity and you can measure the ionization produced by a single particle or a single ray. In this case you have a Geiger counter tube and the recording instrument. If the pulses that are coming to this, the rays that are coming to this come fairly infrequently you can put on earphones and hear each one click in. If you get into a high field they come too fast to distinguish any clicks, it is just a roar.

Then you can read the number of counts per minute on a scale. This instrument is made for measuring both gamma and beta rays. When it is in this shield then it measures gamma rays because the beta rays will not go through the shield.

When you push it out it is surrounded by an open grid. The beta rays can go through the grid and then be detected by the chamber inside.

It can be used for survey purposes but is generally not considered good for that. It is very useful for decontamination purposes.

If you want to explore a person for contamination you can put it behind the ear, under his nose, and you can go over the person quickly with the instrument and determine what radioactive material he may have on him.

Mr. HOLIFIELD. That is a rather expensive instrument there.

Dr. TAYLOR. Yes. I suspect these are someplace in the neighborhood of $100 or $125, maybe, something like that. The prospecting business has brought the price of these down. As I mentioned, this is not easy to calibrate for actual measuring dose.

Here is another type that is very promising. This is known as a scintillation detector. This part of the system is carried on a belt

and here in the end of this instrument you have a crystal that when it is struck by any radiation gives off light.

It may not be usable but each individual ray that comes in will give off a small light pulse. In the back you have a very sensitive light-detecting instrument known as a photomultiplier and with this you can measure individual pulses of light due to just one single ray coming in. Like the Geiger counter, if they come in so fast that you just have a blob of light then you can measure the extent of the blob. And this has a very wide range of sensitivity and I suspect is probably going to replace the Geiger counter type of instrument for field use.

Mr. HOLIFIELD. Is that a more economical instrument or more expensive?

Dr. TAYLOR. I expect at the present time it is a little more expensive than the Geiger counter, but again I think the costs are not too different. I'm sorry I can't tell you much about prices on these.

Next you have the measurement of radiation with film badges. Here you have two problems: One, is the measurement of the total radiation in an area where you want an absolute measure and for this purpose you have a special device that we have developed at the Bureau. This has been used now on atomic energy tests for a good many years.

It is a container in which you put a dental film, which we calibrate in terms of radiation dose. This is a plastic container which in turn is enclosed in a container made up of lead lined with tin. The reason for the lead, the tin, the plastic is to make this measurement independent of the energy of the radiation that falls on it.

This will measure any energy of radiation in roentgens regardless of what its energy may be. The ordinary film without this is quite energy-dependent particularly for low energies.

Mr. HOLIFIELD. That again requires delay in evaluation.

Dr. TAYLOR. That's right. This is a device that would be staked out some place and then picked up later to determine how much radiation occurred at that point.

Then you have the personnel film badge of which this is a commercial model. This is from one of the atomic energy labs. This is a little container which you clip on to the clothing. Inside is a film and this is taken off the person and evaluated as often as may be necessary.

Next you have what is known as the casualty badge. This is more for military purposes than civil defense at the moment. In this you have a piece of special glass that when exposed to radiation will have some certain crystallographic changes take place inside. When this is inserted into an instrument, and an ultraviolet light is shined on it you can evaluate the number of changes that have taken place and it will be possible thereby to determine the dose. This is the sort of thing that might be used at a casualty clearing station for sorting out people on which it is worthwhile to spend effort, as compared with those who have been exposed to such large doses that you would expect them to die anyway and on whom very little effort would be expended.

Finally you have a dosimeter, which is a chemical type that has several small tubes of liquid. You can tell by the color change in this liquid about how much dose you have been exposed to. I don't have one today.

These things are all available in varying forms. There are probably hundreds of these different types on the market at the present time. One of the things we are doing is trying to evaluate these as they come out to see how they fit into civil defense needs.

Mr. ECKHART. Could we ask the doctor at this time to just briefly discuss the mask to prevent the injection of radioactive material or any other protective clothing that he has come in contact with and have been able to evaluate them?

Dr. TAYLOR. We have done no evaluation work on masks themselves but we do know that in a field of radiation caused, for example, by fallout, the primary hazard is gamma rays. You will be living in an atmosphere of gamma rays. The beta ray hazard is secondary and the hazard of material getting into the system is secondary. If you could protect yourself against the gamma rays you will have automatic protection against the mateial that is going to get into the system. Does that not have to be filtered?

Mr. HOLIFIELD. Does that include air in an underground shelter? Does that not have to be filtered?

Dr. TAYLOR. Yes, so you don't pull in radioactive material.

Mr. HOLIFIELD. Does it include injection of water or food?

Dr. TAYLOR. Yes.

Mr. HOLIFIELD. The water and food would have to be in the shelter and have the same type of protection as the individual. If brought in from outside it might be contaminated.

Dr. TAYLOR. This is right unless you had a spring or a well or something like that.

Mr. HOLIFIELD. How effective are the masks against the inbreathing of contaminated dust particles?

Dr. TAYLOR. You can make masks that will go a long way in eliminating dust particles from getting into the system and for military purposes this might be very important. For civil purposes, I think that the mask has no great importance at the present time.

Mr. HOLIFIELD. I was thinking of the air coming into an underground shelter. Assume you did have a temporary shelter in your basement—would there be a hazard of broken windows in the house or broken flooring letting air down that was contaminated?

Dr. TAYLOR. If you are going to go to the trouble of building a shelter, you ought to go to the trouble of adding filters of some sort.

For the individual mask the amount of radioactive material the person is likely to breathe in will be negligibly small compared to the radiation he gets from the surrounding atmosphere.

From a civilian defense point of view, aside from rescuers, masks have no place. In our consideration of exposure to civil-defense workers and population, we neglect the effect of radioactive materials breathed into the system. We know some goes in, but we feel it is relatively unimportant compared with the rest of his dose.

I think that concludes, sir, the notes that I had unless there are some further questions.

Mr. HOLIFIELD. Thank you very much. You have given us indeed some very provocative information this morning and some very valuable information. We appreciate your taking the time to talk to our staff members prior to this meeting and also the time you have given us today.

We know how busy you are and appreciate very much how much you're contributing toward this whole problem.

Dr. TAYLOR. If I can be of any assistance to your staff members at any time in the future, I have told them not to hesitate to get in touch with me.

Mr. HOLIFIELD. We appreciate that and might call on you as we get deeper into this problem.

Dr. Skramstad, can you come forward now and give us a briefing on this computer problem and how much you have developed? What the practical application of it is and for whom it has been developed?

STATEMENT OF DR. HAROLD K. SKRAMSTAD, ASSISTANT CHIEF, DATA PROCESSING SYSTEMS DIVISION, NATIONAL BUREAU OF STANDARDS

Dr. SKRAMSTAD. I have prepared, although I knew about this only yesterday and had only 1 day to get something together. Would you like to have me read this?

Mr. HOLIFIELD. Yes, I would like to have you read this.

Dr. SKRAMSTAD. The National Bureau of Standards now has under development a special analog computer for predicting the geographical pattern of radioactive fallout from a nuclear explosion.

This project originated at the request of Dr. Lester Machta of the Weather Bureau, who by the way is here today, and who came to us last May and asked about the feasibility of designing a computer which would overcome some of the present difficulties in getting rapid answers to the fallout problem.

After consideration of the problem and of existing commercial and experimental equipment, the National Bureau of Standards recommended a novel computer design.

The original proposal was for two phases:

(1) The development and construction of a prototype computer which would be adequate for use in connection with tests of nuclear weapons for use over limited geographical areas where the wind pattern could be considered constant; and

(2) A study of the feasibility of designing a more complex computer to take care of the case where fallout occurs over such a large area that time and space variations of the wind pattern must be considered.

This proposal was accepted by the Weather Bureau, and because of the interest of the Atomic Energy Commission in the development, Atomic Energy funds were provided for the first phase.

By last December, a preliminary model was completed and demonstrated to representatives of the Weather Bureau and the Atomic Energy Commission. At that time it was decided to rush completion of a prototype for test and evaluation in the weapon tests planned for this spring in the Pacific.

We expect to ship the first unit to the Pacific in the near future.

Mr. BALWAN. Have the FCDA approached you on this at all?

Dr. SKRAMSTAD. Dr. Machta has been more or less the person who has been contacting the Federal Civil Defense and has asked us to consider some of their problems.

A few weeks ago, the AEC requested a second computer similar to the first, and we are rushing to provide it so that it also may be used in the spring tests in the Pacific.

These computers accept as input data:

(1) The wind speed and direction at 20 altitude layers; and

(2) Data on the radioactivity of particles in the mushroom cloud as a function of their size and initial location in the cloud.

The output data are presented on a television-type tube so that the intensity of illumination of the tube screen at any point represents the intensity of fallout at the geographical location represented by that point.

This computer has the following advantages over the large-scale digital computers which have been used in the past:

(1) Small size and portability.
(2) Low cost (less than $10,000).
(3) Problem setup without need for special mathematical training.
(4) Instantaneous solution of the problem.
(5) Simple visual presentation of the result.
(6) Rapid setup and modification of input data.

It should be pointed out that the accuracy of the results obtained by the computer, as for all computers, depends on the accuracy of the input data.

Thus the accuracy of prediction of the fallout pattern will be primarily dependent upon the accuracy with which the distribution of radioactivity in the mushroom cloud is known and the accuracy with which meteorologists can determine the wind speeds and directions from ground level up to as high as 100,000 feet.

During the development of this computer, the Weather Bureau has kept civil-defense needs in mind, and has recently asked us for a proposal and estimate of support required to develop a special computer in the course of the following fiscal year to meet this need which is believed to coincide in part with phase 2 above.

We have proposed a program, to start almost immediately and to continue through the next fiscal year, to study the civil defense problem.

This program would include three tasks:

(1) A study of the computer requirements of the Weather Bureau and FCDA in connection with fallout prediction in order to determine the most feasible way of applying analog computer techniques to meet these requirements;

(2) A study of the technical problems associated with the design of special computers to meet the requirements of task 1; and

(3) Based on the results of tasks 1 and 2, the construction of a prototype computer suitable for both experimental forecasting of fallout by the Weather Bureau and also as a model for commercial production in quantity for civil defense.

It is expected that detailed objectives of this program would be worked out in close collaboration with the staffs of the Weather Bureau and FCDA as the program progresses.

I have a few photographs of the computer in case anyone is interested in them.

Mr. HOLIFIELD. Is this machine a machine that could be used in a city of say, 1 million people and by receiving data from monitoring

teams on the ground, that that could be put into the machine and current information as to dosage could be obtained from it?

I am speaking now after the explosion.

Dr. SKRAMSTAD. I think the main use of the machine would be to predict what would happen for an explosion that has not occurred yet, making certain assumptions as to what the radioactivity of this weapon would be. Those would have to be assumptions. Also needed would be the known data on the winds at various altitudes. This would predict the pattern which would occur if a bomb exploded at a given point and the wind pattern remained just as it was.

Mr. HOLIFIELD. You could start out with the assumption that you are dealing with a 1 megaton or any measurement up to say a 10-megaton bomb and by feeding that information into the machine with the speed of the wind at different altitudes and the direction of the wind.

Dr. SKRAMSTAD. Yes.

Mr. HOLIFIELD. You could come out with the prediction of a radioactive pattern as of 3 hours into the future?

Dr. SKRAMSTAD. Yes, or whatever period you want to set into the machine for determining that radioactive pattern.

This development that we have accomplished so far takes care only of the case of a single explosion and is only useful over a geographical area of say of a few hundred miles where you can assume that the wind pattern is essentially constant over this area.

We have been asked, as I mentioned here, to consider the broader problem, but the development so far has been on this first problem.

Mr. FASCELL. I have a quizzical look because it seems to me we had some testimony presented before this committee, I can't recall who it was, it seems to me he had a very negative viewpoint about the use or feasibility or the necessity for doing any of this prediction of fallout.

Mr. HOLIFIELD. I think you missed Dr. Machta's testimony the other morning. This goes right along with Dr. Machta's testimony which was to the effect that the patterns of fallout can be predicted where certain factors are known, such as the size of the bomb, the height of its explosion, the direction of wind currents, the speed of wind currents and we had quite a number of maps here—I'm sorry you missed that.

Mr. FASCELL. I'm sorry too.

Mr. HOLIFIELD. Dr. Machta, would you like to elaborate in response to this question of Congressman Fascell?

FURTHER STATEMENT OF DR. LESTER MACHTA, CHIEF, SPECIAL PROJECTS SECTION, UNITED STATES WEATHER BUREAU

Dr. MACHTA. Simply that our predictions of a fallout area are not perfect by any means, but our analysis of the errors as to those likely to occur are such that they do have value for the civil defense official and their reliability seems to be for that use, and we are working toward improvements of these.

Mr. ECKHART. Can we ask Dr. Skramstad to discuss the other complex computer in greater detail, where it would be located in reference to where this simple computer could be used?

Dr. SKRAMSTAD. Dr. Machta could probably tell you more about it than I could, because our proposal here is merely to get started on

this other problem and I haven't had a chance to discuss these problems with his people yet, as to what the larger problem would amount to.

I imagine it would be concerned with multiple explosions at different points and over a large area where it would be necessary to have knowledge of the wind at a large number of locations.

This is a much larger problem because here you would be concerned, not as you would on the simple computer—with the immediate fallout over a limited area from a single explosion, but you would be concerned with the much larger problem of fallout that was carried large distances from a large number of explosions.

Mr. BALWAN. Does this consider dosage?

Dr. SKRAMSTAD. What was that?

Mr. BALWAN. Does this compute dosage in the pattern?

Dr. SKRAMSTAD. Yes, sir.

Mr. FASCELL. Intensity?

Dr. SKRAMSTAD. It can be set up. It depends upon the characteristics of the radioactivity that we put into the machine as input data. We have what we call a weapons function generator. It is a device where we put in the amount of radioactivity that is associated with the different sizes of particles and with the initial height in the cloud. We can insert a radioactivity that will correspond to what would fall out over a short length of time, or we can assign a number to that radioactivity that would correspond to the long term fallout.

It depends upon how the computer is initially set up. We could compute either of these things or any of these things.

Mrs. GRIFFITHS. The computer can do the computing any place that the information is given to it.

Dr. SKRAMSTAD. That's right.

Mrs. GRIFFITHS. In civil defense in an actual situation who is supposed to be there to feed the information, I mean from the various points?

Dr. SKRAMSTAD. Well, one of these rather simple computers might be put at one location in a city for instance. Of course to be of any value you would have to have some approximation of the type of weapons that was expected and you would have to have the local wind pattern. That would give you a pretty good estimate of what the short term fallout would be over that area.

Mr. HOLIFIELD. Yes.

Mrs. GRIFFITHS. We have to save the Weather Bureau.

Mr. HOLIFIELD. Testimony was given by Dr. Machta that at the present time the two reports a day from the Weather Bureau is going to something like how many hundreds——

Dr. MACHTA. Five hundred outlets.

Mr. HOLIFIELD. So they do have from those two reports the general wind directions and speeds of the wind at this time in those outlets. He said it would be desirable to have 4 reports a day going to those 500 outlets. The variable in this situation as I see it would be the problem of untrained people estimating the size of the bomb and its exact location in an area.

You would have to have that to feed into the machinery, would you not?

Mr. FASCELL. Wouldn't the answer to that be to compute the problem on all size bombs and then you would have the answer, the only variable would then be speed of the winds and direction.

Dr. MACHTA. We would plan to put on the worst size bomb and thus cover ourselves for any eventuality.

Mr. HOLIFIELD. So actually this is to the point of practical use you might say now, even as to the actual predicting of a pattern of fallout.

Dr. SKRAMSTAD. Yes. This machine has just recently been completed. It has not been adequately tested. AEC plans to use this computer in its tests in the Pacific and evaluate its usefulness out there.

We believe the main advantage of this small simple computer, over using a large scale computer, is the fact that you set in the winds by simply turning some knobs at the front. One sets wind at this altiude, so many miles per hour, are from the North and then the computer gives you a picture on the television light tube. For this computer, like any other computer as I said before, the accuracy will be dependent only on how good a model we have of the radioactivity and how well we know the winds.

Mr. HOLIFIELD. Then if you had a plat of a map of the area on your television screen, your pattern would show up on that?

Dr. SKRAMSTAD. That's right.

Dr. MACHTA. You could then move "ground zero" to any point you wanted to.

Mrs. GRIFFITHS. Is there a simple way for a lot of untrained people to make this calculation?

Dr. MACHTA. The Weather Bureau would provide the winds data. We have a responsibility in that direction.

Mrs. GRIFFITHS. This thing will work only if you have some trained persons.

Dr. MACHTA. No; actually the particular device we hope will be developed would require no training but would take a message of what the winds are and turn its own knobs. It would require no skill whatsoever.

Mrs. GRIFFITHS. Does it require trained people or can simple people figure out the speed of the wind——

Dr. MACHTA. We would furnish that information from the Weather Bureau.

Mrs. GRIFFITHS. What if the Weather Bureau is gone, then the machine is gone too.

Dr. MACHTA. You would have no winds whatsoever.

Mr. ECKHART. Dr. Machta, would it not be possible if these things are produce in large quantities to make them available to the Weather Bureau at all the stations where the Weather Bureau has an office, where they have the wind information, make the calculations, and make it available to FCDA and to the public just like you issue daily weather reports today?

Dr. MACHTA. This is a possibility. The only question that would arise is whether this is the most feasible and economical way to do it. Is it better to have the data at the Weather Bureau station or the police station?

Mr. ECKHART. That would mean the FCDA would not have to buy these machines and put them in their office but the Weather Bureau could have them in their offices and transmit the information to them.

Dr. MACHTA. This is a possibility.

Mr. RIEHLMAN. Isn't it conceivable that if this type of information were available in the morning that a prediction could be given just

the same as our weather predictions are given to all the civilians throughout the country?

Dave Garroway's program gives you on the map of the United States what you can expect in temperatures, winds, and storms, and so forth.

If it were computed in the morning and you had that type of chart of the United States and you had this computer working properly you could just put it on the map and the people in every target area would be properly informed of what they might expect in the way of atomic explosion.

I think that could be done. How do you feel about that, Dr. Machta?

Dr. MACHTA. Yes, sir. If communications time is available this would be excellent.

Mr. RIEHLMAN. They are giving you the other information for the protection of the people against storms. Why wouldn't it be more practical now to give us what we might expect should we be attacked by the enemy with a nuclear weapon?

Mr. HOLIFIELD. Certainly during the period of the application of Conelrad this would be an important thing to broadcast assuming television stations were available. Does Conelrad include radio and television?

Mr. FASCELL. Just radio.

Taking a fixed determination which is the maximum type of weapon and applying the two variables, speed and direction of winds, how long would it take a mathematician to figure out what your fallout pattern is going to be?

Dr. MACHTA. You mean how long would it take to do this by hand?

Mr. FASCELL. Yes.

Dr. MACHTA. We couldn't do it in less than 30 minutes.

Mr. FASCELL. This would be instantaneous.

Dr. MACHTA. Yes.

Mr. HOLIFIELD. Thirty minutes might be very important.

Are there any further questions of Dr. Skramstad or Dr. Machta?

If not, we will thank you gentlemen for your assistance again today and your testimony.

The meeting will be adjourned.

(Whereupon at 12:30 p. m. the hearing was adjourned.)

CIVIL DEFENSE FOR NATIONAL SURVIVAL

TUESDAY, MARCH 20, 1956

HOUSE OF REPRESENTATIVES,
SUBCOMMITTEE ON MILITARY OPERATIONS
OF THE COMMITTEE ON GOVERNMENT OPERATIONS,
Washington, D. C.

The subcommittee met at 10:10 a. m., in room 1501, New House Office Building, Hon. Chet Holifield (chairman of the subcommittee) presiding.

Present: Representatives Holifield (chairman), Griffiths, and Lipscomb.

Also present: Michael P. Balwan, staff director; Herbert Roback, director of investigations; Earl Morgan, of the subcommittee staff; and Carey Brewer, Legislative Reference Service, Library of Congress.

Mr. HOLIFIELD. The subcommittee will be in order.

We have before us this morning as our first witness, Dr. Ralph E. Lapp, distinguished scientist and lecturer, and editor of, or publisher or author, let us say, of several books and works on atomic energy radiation and other related subjects.

Dr. Lapp, I believe you have a prepared statement here, and we might go through that first, if that is your order of testimony.

STATEMENT OF DR. RALPH E. LAPP, NUCLEAR CONSULTANT, WASHINGTON, D. C.

Dr. LAPP. Fine. I have a statement of background which I can turn over to the reporter, merely giving some of the vital statistics.

Mr. HOLIFIELD. All right. Well, you might give that for the record, if it is brief.

Dr. LAPP. It is a little long. I suppose I can paraphrase it.

Mr. HOLIFIELD. All right.

Dr. LAPP. It merely states I was born in 1917, in Buffalo, N. Y.; educated primarily at the University of Chicago, with a Ph. D. in physics.

I then had wartime experience throughout the war with the metallurgical laboratory which was the Chicago branch of the atomic project, the Manhattan project.

After that, I came to Washington, and have spent the past 10 years here, working first with the Government, with the War Department General Staff, and then with the Research and Development Board, then with the Navy Department; and I am now working free lance, independently, along the lines you just described.

I have a number of publications in the field of civil defense, which have appeared in national magazines; and I have a number of books which we can insert in the record; three more in process.

I might say, as a matter of introduction, that my interest in civil defense was kindled in the summer of 1946 at Bikini, when I attended the bomb tests there. I must say that this vivid picture of their explosion was in my mind superimposed upon an American city; and when I came back from Bikini, I made my first attempt at writing, and I described the effects of this bomb on a typical American city, but rather than use a 20-kiloton or 20,000-ton bomb, I extrapolated to a 50,000-ton bomb, which at that time was unknown, and essentially unheard of. But I felt in planning for the future one ought to plan for bigger bombs.

In retrospect, one is more or less puzzled by the small step from a 20 to a 50 kiloton bomb, but at that time it seemed such a large step that it was greeted with some degree of skepticism.

Mr. HOLIFIELD. I might say, Dr. Lapp, that my interest also stems from the same events. I was 1 of the 2 House congressional observers out at Bikini, and that vividly impressed upon my mind that we had entered a new age, the atomic age; and, of course, at that time none of us foresaw the hydrogen development which occurred later, and as chairman of the subcommittee which studied the hydrogen feasibility and later recommended that we go into that project, why, it certainly has been on my mind ever since, the terrific weapon which has been produced by the scientists and engineers of our country.

Dr. LAPP. Mr. Holifield, as long as we are discussing Bikini, I might say that Bikini gave us—that is, a second shot, the Baker shot, at Bikini, I believe it was July 25, 1946, gave us kind of a sneak preview of the March 1, 1954, test.

Mr. HOLIFIELD. Yes.

Dr. LAPP. It is rather interesting, if you take the data from—this is the Effects of Atomic Weapons—if you take the data which were given with respect to the Bikini underwater burst, such data as appear on page 279, they give the radiation dosages due to the underwater burst; it is very interesting that if you take these data, and simply scale them up by an area, that the actual intensities of the radiation are in quite good agreement with the intensities one finds for the 1954 superbomb.

Mr. HOLIFIELD. Is that so?

Dr. LAPP. It is a very interesting thing. It would save one a lot of work if they were making calculations. Unfortunately, I didn't arrive at that conclusion until later on.

There is also an interesting parallel, if I can find it—yes, I can—there is a document which I think is of great usefulness, a Government publication called the Radiological Recovery of Fixed Military Installations. It is put out by the United States Naval Radiological Defense Laboratory at San Francisco. It is not a classified document. President Eisenhower's order to review security information got rid of the restricted label, so that this is an unclassified document, and it was released, I believe, on November 25, 1953, just a few months before the actual Bikini bomb test of March 1.

The interesting thing is that the data which are given in here, such as reentry times——

Mr. HOLIFIELD. For the record, you mean March 1, 1952?

Dr. LAPP. 1954.

Mr. HOLIFIELD. 1954?

Dr. LAPP. Yes.

These data apply to a superbomb. It is a very interesting thing, which is completely parallel to the statement I just made about the Bikini underwater burst.

Well, may I proceed?

Mr. HOLIFIELD. You may proceed.

Dr. LAPP. I would like to discuss first the primary effects of thermonuclear weapons, but only by way of skirmishing with the problem, since Dr. Libby has already discussed the blast-heat effects of thermonuclear weapons.

The data were presented in Dr. Libby's testimony before your committee, for 5 and 10 megaton bombs. I believe that it is realistic to assume superbombs to range up to 50 megatons in power. This temporary upper limit to explosiveness is set by the bomb-carrier capacity; in other words, by the sheer weight of the bomb.

Weapon tests will make for more compact warheads, especially for long-range missiles. The requirements of missile delivery will undoubtedly limit the megatonage deliverable in a single package, but it must be stressed that a single ton of uranium bomb material has the equivalent power of 18 million tons of TNT, that is, if you have a hundred percent efficiency.

That does not mean that a bomb of one ton total weight would give that power, for you will obviously have a lot of hardware associated with the detonation scheme.

In my opinion, Civil Defense must plan for bombs with power measured in the tens of megatons. For illustrative purposes, in this testimony I have selected a 20 megaton bomb, that would be one a thousand times the power of the Nagasaki weapon.

I would now like to discuss the human survival, considering the primary effects only; in other words, no radioactive fallout.

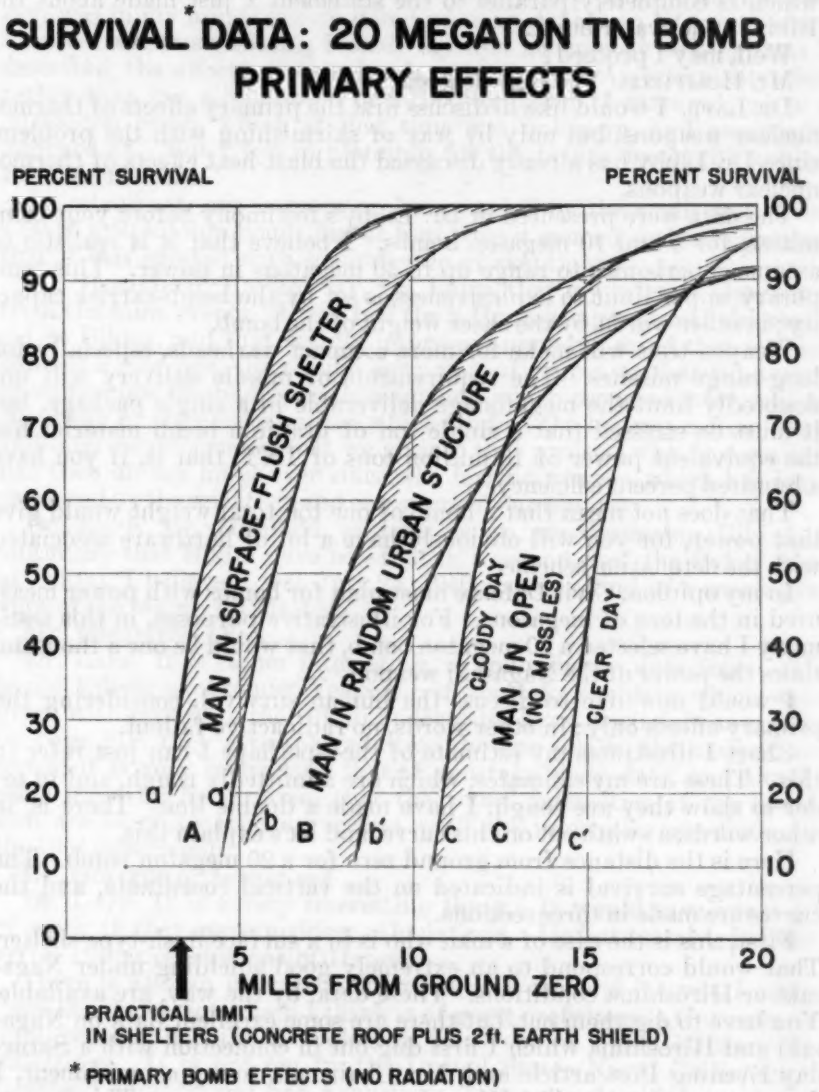
Chart I illustrates my estimate of the—perhaps I can just refer to this. These are my estimates, which are admittedly rough, and in order to show they are rough, I have made a double line. There is, in other words, a swath cut on this curve, and let's explain this.

Here is the distance from ground zero for a 20 megaton bomb. The percentage survival is indicated on the vertical coordinate, and the curves are made in three sections.

First, this is the case of a man who is in a surface flush-type shelter. That would correspond to an extremely good shielding under Nagasaki or Hiroshima conditions. These data, by the way, are available. You have to dig them out, but there are some excellent data on Nagasaki and Hiroshima which I first dug out in connection with a Saturday Evening Post article and, Mr. Chairman, to my astonishment, I found people survived at Hiroshima near ground zero. This is contrary to popular view that you have an area of complete annihilation—that was not true at Nagasaki and Hiroshima.

This means if you scale up the data for a man under good shelter conditions and allow for the sealing of these thermonuclear weapons, that a person would have practically zero chance of survival inside of a 3-mile limit. The tremendous blast, the heat, the cavitation, the

CHART I—SURVIVAL DATA: 20 MEGATON TN BOMB PRIMARY EFFECTS, PRACTICAL LIMIT SHELTERS (CONCRETE ROOF PLUS 2-FOOT EARTH SHIELD)



viscous fireball, would prevent survival within this distance unless one had the most extreme kind of shelter condition which, in my opinion, would be hopelessly impractical on any large scale.

Then this indicates that a person would have about a 50 percent chance of survival at 5 miles in one of these shelters. A better shelter would move it in, let us say, to 4 miles. A poorer shelter out a little farther.

Then at a distance of, let's say, oh, about 7 or 8 miles, a person has a 90 percent chance of probability. In this case, one has to take into account the possibility of, let's say, secondary effects of the weapons themselves, which would tend to fire storms, and so forth.

In the case of a man in an ordinary type building, suburban building or a building such as you would find around at the Bureau of Standards, let's say, this type would be a 50 percent survival at, let's say, a distance of 9 to 10 miles; and a 90 percent survival at a distance of slightly beyond here (about 15 miles).

This is going to cause a little confusion, because I am now going to point out that a man in the open could survive, actually, closer than one in a house, and this is because of the missile effect, that is, the flying glass and other things. This would assume that the man in the open was not hit by it, as much as the man inside a house would be.

Now, that man in the open can survive largely depending upon the heat from the bomb. If the day is a very cloudy day, then he can survive very much closer in, maybe 11 miles, or 50 percent probability at 20 miles; if it is a very clear day, it obviously would go out farther, because the atmosphere would attenuate the heat less.

This, then, gives some concept of the survival of people under three different conditions; and in order to make this a little more graphic for civil defense planing purposes, I have plotted exactly the same data on a different type of scale here, showing the area in square miles rather than the actual linear distance, the radius from the center.

This shows how quickly the shelter survival goes up, and it shows, let's say, at a distance of, for an area of about 60 square miles, outside that area you would have 50 percent survival in shelter.

Then that would increase very quickly.

Whereas a man in the open would, let's say, survive only in an area outside of about 600 square miles.

Now, this illustrates the enigma of Civil Defense, because they have the problem which most of the cities in the United States have: Their central core of population is within that first 100 square miles. Yet, if they plan only on evacuation, namely, on pure distance, for survival, they have to get these people out into an area which is beyond this 600 square mile area.

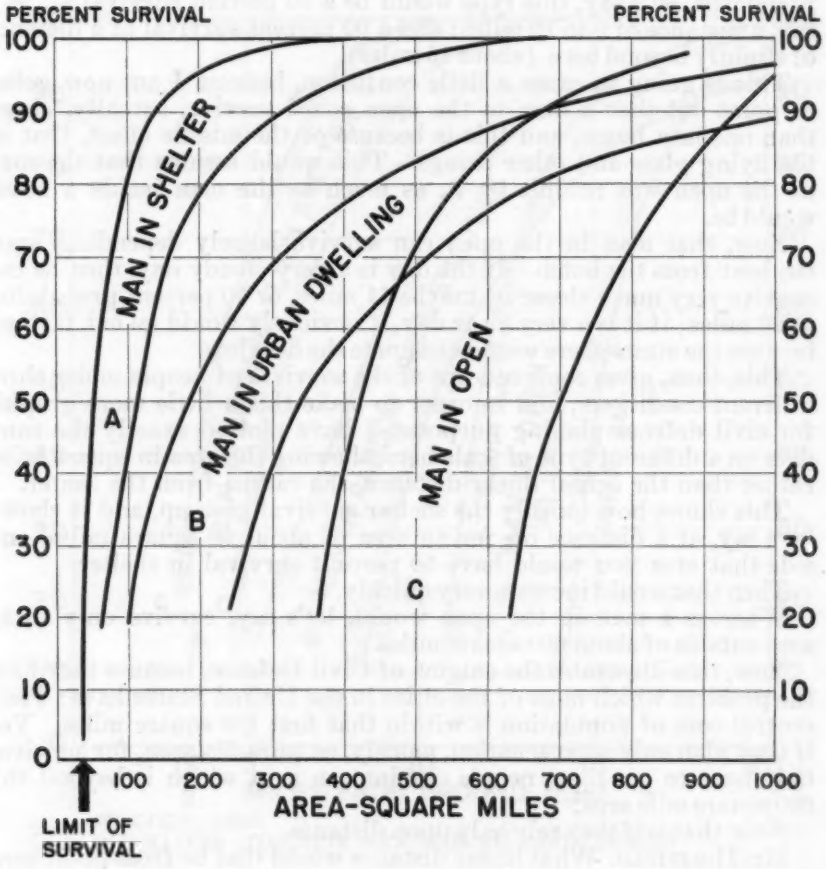
Now, that is if they rely only upon distance.

Mr. HOLIFIELD. What linear distance would that be from point zero, approximately?

Dr. LAPP. This would be about 14 miles.

So this, then, ilustrates the real dilemna of Civil Defense. You have to get from here outside of here. Most of your population is inside of this area, and your problems of transportation increase as you try to get farther and farther out.

CHART II—SURVIVAL DATA: 20 MEGATON TN BOMB PRIMARY EFFECTS, LIMIT OF SURVIVAL



To my mind, this spells out rather graphicaly, quite apart from secondary effects which we will discuss in just a moment, this spells out rather graphically the need for a combination shelter plus evacuation. In other words, relying upon two different techniques to protect you from the bomb, from the primary effects: First, shelter to protect against the primary effects; and the distance in order to make that shelter feasible, because——

Mr. HOLIFIELD. What do you call the primary effects? Blast, heat?

Dr. LAPP. Blast and heat.

Mr. HOLIFIELD. But not radiation?

Dr. LAPP. No. I consider the radiation would be so small from the primary sources that it would be negligible.

However, if you try to protect merely on a shelter basis, if you try to get people located in good shelters, you obviously cannot locate them inside of this area, for the simple reason that it would be too much of a risk. You would have too many people in a small area, and the shelters, because of the condensation of structures in that area, the shelters would be prohibitively expensive.

Therefore, my own proposal, which I will come to at the end of this discussion, is to make a compromise betwen shelter and evacuation, and have a combination which essentially would move into this area. I will come back to that, because I think that it is illustrated by the phenomena of fallout.

This, then, will cover the testimony that I have listed on page 1 and part of page 2.

Now we come to the secondary effects of thermonuclear weapons, and under this category I wish to discuss the radioactive hazards of fallout.

It seems to me that the phenomena of fallout drastically alter the planning for civil defense. It is my impression that radioactive fallout is pretty much of an unknown quantity to local civil-defense forces. And may I say that is based upon fairly random sampling as I go around the country in the course of lecturing and business. I meet quite casually with local civil-defense people; having written about the subject, they figure here I am in town, and they often invite me to their homes to talk about these things.

And I have found that this radioactivity is really pretty much of an unknown quantity at the local level.

In giving my testimony as follows, I would like to preface it with the remark that the data which I am going to give are of independent origin, either from personal calculations or from Japanese experience—specifically, the experience of the Japanese scientists in analyzing the results of the March 1, 1954, explosion.

Mr. BALWAN. Dr. Lapp, is it fair to ask if this information has been confirmed, I mean your findings have been confirmed, by the Atomic Energy Commission.

Dr. LAPP. Well, in my experience, the Atomic Energy Commission has never made a practice of confirming outside or external estimates of any situation. However, in the testimony before the Kefauver committee on February 22, 1955, Dr. Libby was asked a question similar to that, and I believe his answer, although I do not recall it precisely, was to the effect that the data which I presented were not grossly in error, although the Commission obviously would not go

along with some of the conclusions I had presented which might be of a political nature.

I believe, then, in essence, the answer to your question is that they have been partially confirmed.

Mr. BALWAN. Which conclusions did they not go along with? Did they tell you that?

Dr. LAPP. They didn't state.

Mr. BALWAN. Thank you.

Dr. LAPP. The subcommittee has already heard testimony on the prediction of the areas of fallout. I wish to comment on the fact that for modern thermonuclear weapons, fallout areas expand much more rapidly with bomb power than do the corresponding areas hit by blast.

May I use my hands to make this rather graphic? If we consider the blast or heat effects of the bomb, especially blast, it is as though you had a balloon and you blew up the balloon and then considered the area which a plane, the surface of the earth, would intercept with regard to this sphere.

Now, that area will go up slowly as the power of the bomb goes up.

In contrast with that, if we take radioactive fallout and consider how that increases with bomb power, it is much like a situation with dust in a household. If you have twice as must dust, and if it is uniformly distributed, you will have twice as thick a layer of dust on the furniture; and this is the situation with radioactive fallout. It is a pancake situation rather than a balloon situation. And, therefore, the area which can be covered by fallout is in general going to increase very much faster than the area hit by blast or heat.

That is one of the awesome things about radioactive fallout. I hope I made it clear. I am not sure I have.

Mr. HOLIFIELD. If I understand you, the blast is confined to an area such as the air would be in a balloon, which means a pressure in all directions.

Dr. LAPP. Yes.

Mr. HOLIFIELD. But when the radioactive fallout occurs, it flattens out with the surface of the earth.

Dr. LAPP. It is as though you took the balloon and stretched it out over a plane.

In making my estimates of fallout, I focus attention upon an average intensity for radioactivity, although, of course, the actual intensity in a real fallout situation might vary considerably from place to place. Physicists use the word "intensity" in a very precise way. I will define what I mean by "intensity" in terms of the kind of hazards you face.

We measure the dose to a human being in terms of the roentgen, and we mention the dose rate in terms of roentgens per hour. Therefore, when I talk about the intensity, I am talking about roentgens per hour.

The average value that I select correpsonds to the fall-out which one would obtain if the radioactive debris from a 10 megaton explosion were dispersed over 10,000 square miles. This amounts to 1 kiloton of fission products per square mile.

Let me explain that. That is an intensity of radioactivity which is produced by the split atoms of uranium associated with an ex-

plosion equivalent to 1,000 tons of TNT, uniformly spread over 1 square mile.

If a Nagasaki bomb, that is, a 20,000-ton equivalent bomb, TNT, had all of its radioactive fission products dusted over 20 square miles, this would then produce an average fallout of 1 kiloton of fission products per square mile. Fission products in this case is the technical word which describes the split atoms or fragments of uranium. We are going to come to that on the next page in just a moment.

Now, that situation which I have just postulated is actually the situation which Dr. Libby assumed in his speech of December 2, I believe it was, 1954. He talked about radioactive fallout in that speech, and gave a good deal of data about it, but it was all pinned to an atomic bomb; and, as I remember, this was picked up in the press in a very critical way, in which they essentially accused Dr. Libby of talking about old-fashioned A-bombs when in fact one had to deal with the phenomena of superbombs.

I think it is quite clear that what Dr. Libby was trying to do was to present the actual data in this case. It just turns out, as we mentioned right at the beginning, Mr. Holifield, that the situation with regard to intensities just simply is the same for a Bikini 1946 situation and the 1954 situation.

That explains that paradox of the press treatment of that particular situation.

Mr. BALWAN. In other words, is the rule of thumb here 1 ton of fission products plus 1,000 tons of TNT equivalent?

Dr. LAPP. No. I guess I had better go over that one again.

If we talk about the actual mass or weight of fission products, this little cup full of the dust, these quantities become rather difficult to deal with, because they are usually so small. So, rather than that, we simply say it would be the amount that would be produced by an explosion equivalent to 1,000 tons of TNT.

Now, in order to bring it down to solid terms, 1 kilogram, 2.2 pounds, of uranium, if completely fissioned, would equal 20,000 tons of TNT. So, to translate back to the answer you want, 1 pound of the bomb stuff would be equal to 9,000 tons of TNT, or 9 kilotons.

I think we can actually assume that this kind of an assumption is justified without worrying too much about the actual technology behind it, because what we are interested in is not, that is, what civil defense is interested in, is not how much dust is there, but what the roentgens per hour would be. But I wanted to explain the basis for this, to put it on a solid platform.

Obviously, higher yield thermonuclear weapons have a correspondingly higher radioactivity, since more uranium atoms undergo fission, and this, in effect, provides more particles which may then be distributed over a larger area, if the meteorological conditions permit.

It is thus quite conceivable that the fallout areas of 15,000, 20,000, or 30,000 square miles would result.

Let me again emphasize, however, that I am talking about a fallout, an average type of condition which corresponds to this particular 1 kiloton of fission products per square mile which I have assumed. The larger areas for fallout would weaken the intensity, and smaller areas would intensify it.

Let me just double back on that and make sure that it is clear.

If you take a given amount of dust and spread it out over this table, you will get a certain average depth of dust. If this dust were radioactive, it would produce a certain radioactivity which we would measure in roentgens per hour.

If we take and move the dust so that instead of being over the entire table we put it only over one-third of the table, then the intensity of the radioactivity will go up 3 times; and if you condense it to a fifth, it will go up 5 times.

So that, in any fallout area, if this were the fallout area under consideration, the actual fallout will depend, the fallout intensity will depend, upon the meteorology at the time, the weather conditions, which determines how much of it it dumps down in so many square miles.

However, I think it is quite fair to assume that the figure I have selected, this 1 kiloton of fission products for a square mile, is an average situation which we can use to talk about. It may be higher or it may be lower. I think it is kind of in the middle.

Mr. HOLIFIELD. In terms of fog or showers, of course, your intensity would be increased; would it not?

Dr. LAPP. Well, any discrepancy, any abnormality in weather conditions could permit an increase or decrease of fallout within the area. Therefore, you are not going to get the kind of situation I am postulating, a kind of a smooth distribution, but you will have more dust here and less dust here. You will have hot spots and cooler spots within a given area.

Mr. HOLIFIELD. We found that to be true in Bikini. On the *Arizona*, for instance, certain parts of the Arizona were very hot, and certain parts were comparatively cool.

Dr. LAPP. Yes. That was a little bit different type of distribution, though, of fission products, since much of it came from the base surge, which came from a central direction, although it did envelop it; this is a fallout, although it is a very small fallout, so it corresponds more to a household-dust situation than to a Bikini 1946 situation.

Thus, the fallout area dwarfs those hit by blast or heat. A few dozen superbombs may dust a vast amount of real estate with a mantle of serious to lethal radioactivity.

Now we come to chart No. III, to the persistence——

Mr. HOLIFIELD. Before we leave this——

Dr. LAPP. Yes.

Mr. HOLIFIELD (continuing). This subject of radioactivity—there has been testimony before this committee that types of bombs constructed with the use of certain materials could increase radioactivity considerably. Do you agree with that statement?

Dr. LAPP. Would you care to specify what material you had in mind?

Mr. HOLIFIELD. No, I wouldn't.

Dr. LAPP. Well, that leaves me in a rather awkward position to answer the question.

Mr. HOLIFIELD. I will ask the question in a different way.

Dr. LAPP. All right.

Mr. HOLIFIELD. Do you believe that there are materials which can absorb radioactivity like a sponge absorbs water, which could be included in thermonuclear weapons to increase, above this level of radioactivity which you are computing here, the intensity of radioaction?

Dr. LAPP. Let me answer the question in this way: I would say that, theoretically, the answer to that would be, "Yes, you could increase that." But it is a question as to the time persistence of the hazard that you want to make. If you used a material which was activated very easily, such as sodium or something like that, you can get a very high radioactivity, but it dies off very quickly. So that you have to consider what the problem really at hand is in terms of denying territory.

In my own opinion, I think what may be under discussion here is a cobalt bomb, and the concept here is that you take an H-bomb and around the H-bomb you put a mantle of the metal cobalt. The cobalt would then be activated by the outward flash of neutrons, which convert ordinary cobalt into cobalt 60, which is radioactive cobalt with a half life of 5.3 years.

This has been widely popularized. In fact, I can tell you of my own personal experience in giving lectures around the country and getting questions after a lecture, that the cobalt bomb is assumed as a stockpiled item in our arsenal. The United States, to my knowledge, has never made a statement on the cobalt bomb. I believe it would be worth while to make a statement.

Let me say that, in my opinion, a cobalt bomb could not compare in its lethality, so far as radioactivity is concerned, with a superbomb in which that outer mantle is not cobalt but uranium.

The reason for that is—it is a technical one. When you take a uranium atom——

Mr. HOLIFIELD. You are talking—when you say an outer cover of uranium, you are talking about ordinary uranium metal?

Dr. LAPP. I would be talking about ordinary uranium metal or any combination of that uranium with any degree of enrichment, you might say, of that. I wouldn't rule out the possibility of it being not pure uranium. But I think in terms of a rough answer to your question, one could say, "Yes."

Let me explain just a point of technology, which is a pretty puzzling one to get across to anyone who does not know nuclear physics.

When you split a uranium atom in 2, it is rather perverse; it does not split into precisely 2 equal parts. One would think it would, and this has been one of the fundamental problems of physics, to solve why it does not.

But when you split a uranium atom in two, it prefers to split into a number of different things, a heavy part and a light part. If you take a single atom of uranium and split it right in two, that particular atom might split into, let's say, barium and krypton, barium being that element which is present in that milkshake you taken when you have an X-ray series, and krypton being a noble gas.

But in addition, if you take not—well, let's take a thing this big [holding a paper cup]. This would correspond to about 1 kilogram of uranium, if this were solid uranium.

Supposing we took that solid uranium and completely fissioned it, so that every single atom split in two; and then supposing we had some kind of a miraculous experiment here so that we could collect all the split atoms, obviously if it were a bomb explosion, that stuff would fly apart. But if we could manage to collect it and bring it all back into 1 piece again, we would have not quite a kilogram of this

material, because, to be precise about it, there would be a tenth of 1 percent less because you had some mass which was essentially converted into energy.

In other words, Professor Einstein took about a tenth of 1 percent discount here on the original. But the material then would consist of 3 dozen different chemical elements, which range from yttrium to gadolinium, samarium, technetium, promethium. There are all sorts of rare elements which are produced.

Each one of these rare elements may have many different radioactivities associated with it. In face, if you want to make a real kind of survey of them, there are about 200 different radioactivities involved in these split atoms of uranium.

Of those 200 different kinds of radioactivity, some are very evanescent and they vanish in a few seconds, because they have a short half-life. Others take minutes, hours, days, weeks, or months, or years.

So I think this comes back, by a roundabout way, to answering your question. In there is something for everybody. You don't have just a 5.3-year half-life; you have one pretty close to it, but you have things which can be effective in the first hour, in the first day, and the first month.

In terms of the potency of the fallout, it is a much more lethal type of radioactivity.

I realize that is a rather technical answer to the question, but it is a very technical problem.

Mr. HOLIFIELD. I think your answer was very good. I think, from a layman's standpoint, it is understandable.

Mr. BALWAN. This has been described by a lot of people who speculated on the bomb in the Bulletin of the Atomic Scientists.

Dr. LAPP. Yes. There has been a series of articles which appeared in the Bulletin of the Atomic Scientists which we can, if you wish, make a part of the record, I have copies of them, which originated in November of 1954, and continued through until November of 1955; over a period of a year there were four articles.

In addition, we reprinted speeches of Dr. Libby, and we have reprinted considerations on fallout which were published in other countries.

This persistence of radioactivity is illustrated in chart No. III.

The data given there illustrate the die-off or fadeaway of radioactivity which results from the detonation of a 20 megaton bomb exploded at noon, yesterday. I assume that 10 megatons of the fission products are dispered over an area of 10,000 square miles. These are nice round figures. The rate at which the radioactivity dies off is very complicated, for the reason that I have just explained in answer to your question, Mr. Holifield, because there are so many different types of radioactive emitters.

The ones of most concern are those of medium or long half-life. The quick-decaying or short-lived fission products dissipate their radioactivity in the atmosphere before the fallout descends to earth.

Mr. BALWAN. What time would that be, roughtly?

Dr. LAPP. In terms of practical times, within about an hour to a day, at most. This would be the general bracketing time for the local fallout.

CHART III—PERSISTENCE OF RADIOACTIVE FALLOUT

PERSISTENCE OF RADIOACTIVE FALL-OUT

BOMB BURST:

MONDAY	3 PM – MIDNIGHT	1200 ROENTGENS*	
TUESDAY ...	1st 12 HOURS	500	"
	2nd "	275	"
WEDNESDAY ..	1st 12 HOURS	165	"
	2nd "	125	"
THURSDAY ...	ALL DAY	190	"
FRIDAY	"	125	"
SATURDAY ...	"	95	"
SUNDAY	"	80	"
MONDAY	"	60	"
2nd WEEK ..	ALL WEEK – 7 DAYS	280	"
3rd WEEK ...	"	160	"
4th WEEK ...	"	130	"
2nd MONTH ..	30 DAYS	220	"
3rd THRU 6th MONTHS	– 4 MONTHS ...	300	"
	TOTAL	3805 ROENTGENS	

* Exposure to an unshielded person on flat ground assuming no penetration of fall-out debris into the earth

Bear in mind that some of the material which is in the bomb goes up so high that it punctures the stratosphere, is injected into, let's say, the 100,000-foot level, and goes around the world many times. That is one of the odd things about the bomb explosions. It is that the very small bombs, let's say the atomic bombs of the tactical or battlefield type, let's confine them to size range below 100,000 tons of TNT, these bombs drop their fission products in the first or second transit around the globe.

On the other hand, the big fellows, the superbombs, let's say, in the megaton class, inject the stuff so high into the stratosphere and produce such small particles below the visible limit, they stay aloft—in fact, from the March 1, 1954, explosion, there is still a great deal of the material circulating in the upper atmosphere.

Mr. BALWAN. If one wanted to conserve the fallout, though, so it would not pierce the 100,000-foot mark, could not one deemphasize the blast so that it wouldn't shoot up that far, and still keep the same amount of radioactive materials within the troposphere?

Dr. LAPP. I think you could probably deemphasize the blast, but I am not at all certain as to how much you could, because I think what is involved here, what you may have in mind, is a subsurface blast.

In this case, the subsurface blast would have to be, the bomb would have to be buried very deep in order to create kind of an optimum condition, because what would happen is that if the bomb were shallow, it would vent so quickly that to all intents and purposes it could be considered a surface burst.

Mr. HOLIFIELD. Let us clarify this point a little bit. Dr. Libby testified, as you have pointed out, that there was a puncture of the stratosphere, and the general language of his statement indicated that a large percentage of the radioactivity did go into the stratosphere.

I stopped him at that point and questioned him as follows:

I said, "Is it not true that there was enough radioactivity left in the troposphere to cause the 7,000-square mile pattern of radioactivity which you described?

And he said, "Yes."

I was afraid that people would get the idea that just because it was a big bomb and because it punctured the stratosphere, that therefore a great deal of the force was gone, and they had nothing to fear. My object in asking the question was to point out that there was still enough left to cause a tremendous amount of lethal damage.

Following through on that, and along the line of Mr. Balwan's question, if it was not desired to make a bomb large enough to carry the column of radioactivity in the initial burst into the stratosphere, it would be perfectly simple to make smaller bombs, say, in 2, 3 megaton class, which would not puncture the stratosphere to the extent that a 10 megaton would, let us say, and therefore, most of the radioactivity would remain in the troposphere rather than escaping into the stratosphere. Is that not true?

Dr. LAPP. I would say that an answer to that question, Mr. Holifield, ought to be based upon empirical data. I simply do not know. It might be. I think it is plausible.

My own feeling is, to come back to Mr. Balwan's question, that we have not tested bombs under a variety of conditions so far as producing the most adverse condition is concerned.

Mr. HOLIFIELD. That is right.

Dr. LAPP. We test bombs under ideal conditions to minimize radioactive fallout.

Mr. HOLIFIELD. In other words, they wait for days and even longer, for days into the weeks, for an exactly perfect atmosphere condition for observation and for scientific recording, and the like. Whereas in actual warfare, you would take the normal conditions, which would be crosscurrents of wind and maximum humidity in the air, and many other factors, which would actually make the explosions much more lethal than the ones which have occurred under ideal weather conditions.

Dr. LAPP. I think also, Mr. Holifield, we have tested our bombs under rather peculiar circumstances, tropical meteorology, lagoon conditions. We have never tested a multimegaton weapon over a completely contiguous land surface.

Mr. HOLIFIELD. That is right.

Dr. LAPP. I think we might be in for some surprises.

I recall one surprise. We tested a small bomb in Nevada, and the cloud went up and hit the jet stream, and then I think within 1 to 2 days it traveled from Nevada and suddenly there was a fallout over the area of the city of Troy, N. Y., and the fallout was quite severe.

Mr. HOLIFIELD. A lot of the film in the Eastman Laboratories was ruined.

Dr. LAPP. This was much more intense than just necessary to ruin film. This was quite a severe fallout, I think one of the worst they ever had in the United States, if not the worst.

If that fallout had occurred close to when the radioactivity was born and had not had a day or two to fall off, you would have had a much more severe condition.

I repeat, our experience with radioactive fallout is very limited.

Mr. HOLIFIELD. That is true. And on that point, the continuous attempt to stop these tests may be very dangerous from a standpoint of acquiring the knowledge necessary to protect ourselves.

Dr. LAPP. On that point, although I guess it is not in line with testifying on civil defense, Mr. Holifield, if I could be permitted to make this observation. I have thought about this problem of the cessation of tests at some length. It has many angles to it, and one of them is, it seems to me, a rather practical one.

The purpose, as I understand it, of future bomb tests, especially some of these which might be going on in the Pacific very soon, is to develop a compact warhead for an adequate delivery system, specifically, a missile.

If you are going to develop, put billions of dollars into a missile, then it seems to me it would be quite paradoxical not to go ahead and develop the warhead for it. If you were to cease testing and thus forego an adequate warhead for the missile, you might just as well consider foregoing development on the missile itself.

Mr. ROBACK. Dr. Lapp, does that conform to—I mean, do you understand, in that context, that the development of these missiles which have been discussed, would be contradictory to any kind of agreement to stop further production of nuclear weapons?

Dr. LAPP. As I understand the production of nuclear weapons, they pertain to the nuclear phase of the weapon, to the explosive

phase, and they do not pertain to what is, in my opinion, now the critical phase, namely, the delivery system.

As I understand the proposals which have been made in the area of international negotiation, they pertain only to the nuclear phase.

Mr. HOLIFIELD. The billions being spent to develop an intercontinental ballistic missile, the delivery part of it——

Dr. LAPP. Yes.

Mr. HOLIFIELD (continuing). Would be wasted——

Dr. LAPP. Yes.

Mr. HOLIFIELD (continuing). Unless it carried a high-yield nuclear warhead.

Dr. LAPP. I believe if one were to merely put, as the Germans did, 1 ton of TNT on a V–2 and use this as a weapon, that certainly we would have bankruptcy in this country before we would ever do any appreciable damage to the Soviet Union. I am quite sure that is the case.

I might say—and this is, perhaps, a heretical thought to nuclear physics—that, in my opinion, the critical phase of the present arms race is no longer in the field of nuclear weapons, so far as the nuclear phase of the weapon is concerned, because I think these things are quite powerful, and it is the delivery of the weapon which is all-critical.

Mr. HOLIFIELD. That is right.

Dr. LAPP. On this chart we start on Monday noon, yesterday noon, and we have the explosion; and then we consider the fallout. I am assuming that the fallout will begin within 3 hours.

From the period from 3 o'clock in the afternoon until midnight of last night, the total dose which would be delivered to a completely exposed person, that is, a person who stood on the surface of the earth, considering it to be flat and there was no draining off of the dust at all, that it just stayed on the surface of the earth, the dose to that person would be 1,200 roentgens.

To translate that into the area of meaningful dimension to the human being, that would be two or more times a lethal dose.

Now, if we take the next 12 hours——

Mr. BALWAN. That is an accumulation of 9 hours, the 1,200 roentgens?

Dr. LAPP. That is right. If he stood out there for 9 hours. If he were in a shelter, he could be almost completely protected from it, depending upon the shelter conditions, which we will be discussing in just a moment.

From midnight last night to noon, there would be a total of 500 roentgens accumulated, that is, on top of the 1,200, which he would have received if he stayed out all the time, if he were sleeping out in the open, let's say. That is, again, a lethal dose.

From noon today until midnight tonight, there would be an additional 275 roentgens. That would mean, for example, if you stayed sheltered until noon and were then exposed for 12 hours, that dose would not kill you, but it would certainly produce serious sickness.

Now, the schedule is listed——

Mr. HOLIFIELD. Providing that exposure was of short duration. However, if they stayed in an area where that exposure persisted on

the graduated scale which you have, following it there, it would become cumulative and, therefore, lethal.

Dr. LAPP. Yes.

The schedule is then as indicated, dropping to 190 roentgens on Thursday, that is, 24 hours. Friday, 125; Saturday, 95; Sunday, 80. And a week later, you can see, a week from yesterday, the intensity would still be 60 roentgens per day, which is certainly a serious number of roentgens to consider.

In the second week, all during that week, the total would be accumulated, if you were out in the open, unsheltered, of 280 roentgens.

What that means is if, during the first week, you took shelter, and it were really a perfect shelter so that you got zero exposure, no roentgens, then if you came above the surface of the earth and tried to live quite normally, you would not get 280, because you would be inside the house or something; but if you have to consider a kind of optimum, I mean maximum condition, it would be a sickness dose of radiation.

The third week you are dropping to 160; the fourth, to 130. As you get beyond this point, it becomes less meaningful to put specific numbers in. Because of the vagaries of precipitation, some of this material will drain off, get buried in the earth and, therefore, shielded.

I believe that one of the things which civil defense has to provide is some practical experience data on the rate of fallout of this over an area of a square mile or a hundred square miles. I think we have to provide actual data.

These hazards, however, are very long-term. For example, you note for the last 4 months there is a total of 300 roentgens. That would be maximum for this average kind of condition.

However, if you were in an area of more severe fallout, and certainly many areas would exist, then you could have a much greater dose, and this brings us to the problem of what a person does if he is caught in the area of fallout.

And I think you will grant, with areas of fallout measured in thousands of square miles, this might include a very considerable section of the population.

The possibility of evacuating people to relatively safe places depends upon adequate instrumentation, adequate knowledge, through instrumentation, as to where the regions are which are safe.

Mr. HOLIFIELD. Of course, this requires an effort on the part of civilian defense which just simply has never been made.

Dr. LAPP. It is a problem, I think, which surpasses anything which has come up in civil defense.

Mr. HOLIFIELD. It means the supplying of radiation detection instruments on a large scale; it means the consideration of the shelter problem on a scale heretofore not even imagined, as far as we know, by planners, or at least not reduced to tangible efforts.

Dr. LAPP. Well, I think this timetable of the roentgen does spell out an extremely serious challenge to civil defense.

When I first ran up against this myself, I must say I was completely startled by it. In fact, to the point of doubting it. Previous experience had not indicated this kind of a hazard. But it is because we are dealing with a radically new type of weapon, which produces this enormous radioactivity.

Mr. HOLIFIELD. It is entirely possible that areas of several thousand square miles could be declared off limits for a matter of months, as far as permanent residence in there is concerned.

Dr. LAPP. I think so far as permanent residence is concerned, your statement is absolutely true.

The statement we get into—perhaps I might get into the next page and cover some of this material, because it does pertain to the question of: When do you go back, or when do you come out, or when it is safe to live?

Mr. BALWAN. May I clear up another point pertaining to this table. Your assumption here is the detonation of a 20-megaton bomb. Would these figures be the same for a 1-megaton bomb or a 10-megaton bomb, if you assumed a smaller square-mile fallout?

Dr. LAPP. They might be, yes. This is an average condition. If you take a 1-megaton bomb and distribute its products over a thousand square miles or a 10-megaton over 10,000 square miles, the same average condition could obtain, given the proper meteorology.

Mr. HOLIFIELD. Therefore, if we take the pattern of attack as used in Operation Alert, and I believe that envisaged the dropping of, what was it, 60-some-odd, 1-megaton bombs——

Dr. LAPP. Yes, the Operation Alert, 1955.

Mr. HOLIFIELD. Yes.

Dr. LAPP. I believe there were only a few megaton-class bombs in there then.

Mr. HOLIFIELD. That is right. There were some 2, 3, and 5.

Dr. LAPP. I believe that most of the bombs, as I recall, at least 3 dozen of the bombs, were measured in the 20-, 30- and 40- and 50-kiloton class; in other words, Hiroshima-Nagasaki bombs.

Mr. BALWAN. But they had 1, 2, and 5.

Dr. LAPP. They did have, yes.

I believe the largest bomb in Operation Alert in 1955 was a 5-megaton bomb.

Mr. HOLIFIELD. That is right.

Mr. BALWAN. I have another question.

Mr. HOLIFIELD. If you had—I would like to pursue that just a moment—if you did have that type of saturation bombing on 50 or 60 of our principal targets, you would have an overlapping of radioactivity in many instances, a compounding of radioactivity, because of the overlapping patterns of radioactive dust, would you not?

Dr. LAPP. You would have a smeared-out situation which you would have because of the vagaries of wind. You would have one area getting, let's say, in New Jersey they might get fallout from Philadelphia and from Baltimore, and it would be the overlap of the two.

If these overlaps came simultaneously, estimating the dose would be relatively easy. If the overlaps came on one day and then the other, then you are going to get a very confused situation with regard to the rate at which it dies out. It is a very confused situation.

Mr. HOLIFIELD. But very lethal.

Dr. LAPP. It could be, yes.

I would like to discuss four situations with regard to this question.

Mr. BALWAN. I have another question here. How much of this table has been made public by the Atomic Energy Commission, and how much are extrapolations of yours?

Dr. LAPP. The Atomic Energy Commission has made public the data from noon yields until midnight. The data they gave talked about the first 36 hours. In the statement, the official Atomic Energy fallout release of February 15, 1955, they discussed the number of roentgens which would be delivered within certain areas over the period of the first 36 hours.

Mr. BALWAN. So this does conform with the AEC position?

Dr. LAPP. I think I can answer this question quite specifically now. The rest of this is—there is a certain law which is obeyed here, it is called the t to the minus 1.2 law, which I think is almost impossible to explain to nonscientists. You have to illustrate it in terms of numbers, not in terms of a mathematical equation.

This law is the same law which Dr. Libby used in his testimony, but I do not—to the best of my knowledge, the Atomic Energy Commission has not published any figures showing this long-time persistence.

Mr. BALWAN. For the first 36 hours, they have tables out which would show there would be an accumulation in the first 9-hour period of 1,200 roentgens?

Dr. LAPP. Oh, yes. These data are consistent, yes.

Mr. HOLIFIELD. Mrs. Griffiths?

Mrs. GRIFFITHS. Since civil defense is not supplied the instruments by which you can ascertain the radiation in the air, would you not say that one of the really necessary things is to disperse the factories which make these instruments so that at least you would have a chance of making them?

Dr. LAPP. No, Mrs. Griffiths. I think that we have to consider the time elements here, the time when you are going to need the instruments——

Mrs. GRIFFITHS. Is there—

Dr. LAPP. When the bomb drops.

Mrs. GRIFFITHS. Certainly.

Dr. LAPP. And to have the instruments produced afterwards, from dispersed sites, it seems to me might not be too valuable.

Mrs. GRIFFITHS. But you are not going to have any of these, anyhow.

Dr. LAPP. We went through a long period—this question of instruments is very close to my heart, Mrs. Griffiths.

Mrs. GRIFFITHS. Mine, too. I am for buying these instruments in direct ratio to the way we buy the bombs.

Dr. LAPP. Direct ratio, let's say, with a scale-up of perhaps 10,000.

Mrs. GRIFFITHS. Right; yes.

Dr. LAPP. I would agree with that. I think that the matter of adequate instrumentation is the matter of providing sight for blind people.

Mrs. GRIFFITHS. Yes.

Dr. LAPP. Because you will all be blind when this happens. You have to have instruments.

Now, we have been giving a pretty grim part of this thing. We have not gotten to the phase of what we can do about it. There are things you can do, but you can do nothing unless you know it is there.

Mrs. GRIFFITHS. That is right.

Dr. LAPP. And the instruments are——

Mr. HOLIFIELD. Well, it boils down to this, Dr. Lapp, that from 50 to 75 million American citizens in the urban centers are sitting like

ducks in a pond, subject to a hazard which they cannot see, which they cannot evaluate, but which will undoubtedly occur if we have a surprise nuclear attack at this moment. Is that not true?

Dr. LAPP. This has worried me for some time.

Mr. HOLIFIELD. We are spending $35 billion a year to make these bombs and deliver them, with the rest of the military hardware, and we are spending, according to the congressional appropriation, about $86 million for all types of civil-defense effort. Is that not an incongruous and a tragic situation?

Dr. LAPP. I think you are absolutely correct on that. I think that the provision of adequate instruments and the erection of a civil defense against these hazards is certainly as important as making more bombs.

Mrs. GRIFFITHS. That is true.

Mr. HOLIFIELD. Can a military effort persist in the face of this type of a hazard, if we are struck with it?

Dr. LAPP. I feel that one of the weakest points, Mr. Holifield, of the national defense right now is to have an enormously strong right hand, but to have an extremely fragile glass jaw; and the fragile glass jaw is the high vulnerability of the United States to attack. It seems to me one of the greatest——

Mr. HOLIFIELD. This committee has had briefings on the power to strike——

Dr. LAPP. Yes.

Mr. HOLIFIELD [continuing]. Of our own Strategic Air Command, and we have also had briefings on the power to defend against that type of an attack, and I do not think there is a member of this committee but would not agree with you on that point.

Dr. LAPP. Mr. Holifield, I think there is a point which might be emphasized. This power to attack is the kind of power you hope never to use. It is deterrent power. I think we are all agreed that it is a deterrent power.

If you are going to really impress an enemy with the power of a deterrent, it seems to me you have to have more than just the strong right hand. If you give the impression of not really being willing to use that deterrent, then, it seems to me, you have undercut the power of it.

Mr. HOLIFIELD. And if you have the glass jaw, as you say, the enemy is more likely to strike——

Dr. LAPP. Yes.

Mr. HOLIFIELD [continuing]. Than if you have a strong iron jaw along with the strong right hand.

Dr. LAPP. I do not think he will think you are serious.

The problem we have to consider now is this vexing problem of the meaning of the roentgen to civil defense. Bear in mind that it is a completely new dimension. It is something that you do not see, you don't feel, until it is too late. You have to have instruments to measure it.

And even so, with instruments you know something about the rate at which radiation is being delivered, but there are the effects of radiation on the human body which are not completely known. I think there are many areas where medical men, if they appeared before this committee, would simply have to admit that our knowledge is very meager.

Now, first, we must consider how much radiation is safe, and Dr. Taylor, of the National Bureau of Standards, has given this subcommittee very helpful testimony with regard to the roentgen as the unit of energy absorption. He pointed out that we regard 0.3 roentgen per week, or the equivalent of 15 roentgens per year, as safe.

Now, I am sure he would be the first to have it stressed that this sofety limit is not one which we regard as an upper limit. We like to conform to the rule that we want to get as little radiation as possible.

I think in our laboratories, if we have a man who gets 0.3 roentgen every week, he will soon be given instructions on how to change his type of conduct in the laboratory, because we don't want people getting 15 roentgens a year.

That, however, is a peacetime situation. In a war, we would not be apt to pay much attention to peacetime tolerances or safety limits. Therefore, you have to consider the matter of emergency limits.

If one, for example, waited until the intensity dropped to the peacetime limit, or 0.3 roentgen per week, which would be about 2/1000 roentgen, 2 milliroentgens per hour, much of the fallout area would be denied to habitation for several years, unless measures were taken to decontaminate the environment.

It must be stressed that no one has any practical experience in decontaminating thousands of square miles of territory.

Mr. BALWAN. Dr. Lapp, may I ask a question at this point here?

Dr. LAPP. Yes.

Mr. BALWAN. Somewhere I heard the statement here of 0.3 of one roentgen per week as being a maximum permissible limit for dosage to be tied to, say, the risk which an insurance company might undertake in underwriting insurance. Is there anything to that?

Dr. LAPP. I believe that Dr. Taylor testified as to the origin of the 0.3 roentgen per week. The maximum permissible dose—it used to be called the tolerance limit—can be a very confusing term. It is a limit we set up on the basis that if you got this every week day for all year, for 25 years, that we think it would not produce serious harm to you.

I think there are very few people who would question the fact that there would be some harm, because there we get into something I have inserted into my testimony just this morning, and I will come to it in just a moment.

Mr. HOLIFIELD. Is it not true that the radioactivity, the roentgen, has a different effect upon different people, too, for instance, children as compared to adults?

Dr. LAPP. Different people have a different degree of sensitivity, but by and large, the roentgen is pretty universal. If we give you 400 to 500 roentgens, it will kill 50 percent of the people. Some will be killed with as low as 350 or perhaps even 300. But all will be killed by, let's say, 700 or 900 roentgens.

There is kind of a distribution curve. We are not all equally sensitive.

The third point I would like to consider is that even when you talk of emergency limits, we must realize that this radioactivity dies off in a strange, nonuniform way which is difficult to explain to an ordinary person. The occupation times permitted for different individuals will

depend upon how much radiation they have had or how long they will be exposed.

Referring to this chart, it is obvious that a person could emerge after a week, if he had been protected, and stay outdoors all day, without receiving a sickness dose of radiation. Yet he could not repeat this performance for many days without incurring radiation damage to his body.

At this point I would like to insert into my prepared statement the fact that we must consider the unusual nature of radiation effects.

In the case of a massive, single dose of radiation, you might feel effects quickly as with a big dose of arsenic. However, the persistent hazard is more subtle. The effects of radiation may be long delayed; years later the effects may pop up.

To give a current example, within the past week, Madam Curie's daughter died of leukemia which was produced as a result of dealing with radioactive substances. Ironically, Madam Curie herself died of radioactivity, and her husband, Pierre, would have died of radioactivity if he had not been run down by a horse and carriage, because he was more severely exposed than Madam Curie.

They knew about the hazards of radioactivity almost as soon as it was discovered, and certainly her daughter knew about this, because she came along later; and yet here is an instance, a current instance, of radiation death in people who are very intelligent and know about the hazards.

Incidentally, to take a horrible example, a friend sent me a clipping from the Chicago Tribune. This was on Valentine's Day, I believe, and it was a photograph showing Hildegarde, the singer, in the show window of the Chicago Federal Savings and Loan Association, and they had a fluoroscope, and an artist was using the fluoroscope to do a model of Hildegarde's heart.

This is making radiation a toy thing. My own impression is that the radiologists and roentgenologists of Chicago should have protested such a display very strongly. Radiation is not to be used——

Mr. HOLIFIELD. Is it not true, by the very nature of the exposure under a fluoroscope, that a person is exposed to more hazard from radiation than under an X-ray?

Dr. LAPP. Yes, much more. Of course, when you talk about X-ray, we are talking about an X-ray photograph.

Mr. HOLIFIELD. Yes.

Dr. LAPP. A single shot. It is the difference between a still picture and a motion picture.

Mr. HOLIFIELD. Yes, that is right.

Dr. LAPP. And you get many more frames, let's say. And in fluoroscopy, in the hands of a competent radiologist, roentgenologist, they carefully adjust the dose to the individual, and obviously this is done on a calculated risk basis.

Mr. HOLIFIELD. That is right.

Dr. LAPP. If you have cancer of the stomach, you obviously want to find out about it, and to forego having the X-ray would be to insure your death by cancer.

But there are these curious after effects. I have a paper here, a recent one, in the Acta Radiologica. Here is carcinoma, cancer of the skin, appearing 49 years after a single diagnostic roentgen exposure.

These effects are quite insidious and delayed, and I think they illustrate the fact that our knowledge of this hazard is still not complete.

Mr. HOLIFIELD. What has been the medical history of some of the people exposed at Hiroshima and Nagaski? Have there been development of leukemia conditions, cataracts on the eyes and skin?

Dr. LAPP. There have been post-effects in Hiroshima and Nagasaki which have been followed by the Atomic Bomb Casualty Commission Survey. I do not know the specific figures, but I do know there has been radiation cataract, there has been leukemia and other things which have been followed. There is a greater history, however, in the medical profession itself.

Many of the doctors of medicine, using X-ray, fluoroscopes, and so forth, have, and using them day after day, have undergone radiation injury. The men who know them best, so to speak still have the injuries. And I think it is because, despite the fact you use something today and nothing happens, you use it again tomorrow and nothing happens, and you have kind of a cavalier attitude toward it.

I think your committee members will find if they get a dozen experts on radiation to come before you, that you will probably have a dozen different opinions of the danger of radiation. Some people will say "This fallout problem is nothing at all. All you have to do is dust yourself off and wash and there is no problem."

Other people will say it is an enormous problem.

My own feeling, which may be helpful in diagnosing this difference between the so-called experts, is that too much of our knowledge about fallout is taken from an extreme situation which is not applicable to the United States. It is taken from a very artificial situation; from a test in the Pacific Ocean, where the people who were exposed were, let's say, on small boats.

Well, a small boat in the open ocean is scarcely a situation which is easily transferred to the United States. The stuff which falls in the ocean itself does not hurt you. It is only that which is on the deck of the ship. Therefore, if you hose off the deck of the ship, you readily decontaminate it so that there is no persistent source of hazard to you.

But to assume this kind of condition applies to several thousand square miles of a metropolitan area is, to me, to be a sublime optimist.

Mr. ROBACK. Mr. Chairman.

In that connection, may I note, since Dr. Lapp has made a rather extensive study of health conditions in relation to radioactivity, this is a pamphlet which is put out by the Federal Civil Defense Administration called Survival Under Atomic Attack. The Government Printing Office reported recently in a story in the New York Times, that a million copies had been sold. It is one of the best sellers. It ranks top list.

It states here, with regard to the people of Nagasaki and Hiroshima:

> The war may have changed their way of life, but they are not riddled with cancer. Their children are normal. Those who were temporarily unable to have children because of the radiation now are having children again.

Dr. LAPP. Yes.

Mr. ROBACK. Would you care to comment on that? Do you believe that it is a justified statement in light of the present knowledge?

Dr. LAPP. So far as the sterility is concerned, that is justified. The people are having children.

Do you wish me—I would prefer not to discuss the genetic effect here, because it is much to subtle for a physicist to discuss.

So far as the other statements are concerned, I think that they must be regarded as generalizations. I would assume whoever wrote the pamphlet was making a statement with regard to a very general situation, without getting into statistics on people who were damaged.

Mr. HOLIFIELD. And they are making it about a 20,000-ton bomb in place of a million-ton bomb.

Dr. LAPP. What is the date of that?

Mr. ROBACK. Before we discuss that, Mr. Chairman, the New York Times reported the Superintendent of Documents has having sold more than a million copies, one of the best sellers.

The superintendent commented that this publication has passed its peak sales. It has not been revised since the disclosure of the hydrogen bomb. Its revision is not up to Mr. Buckley; "Happily," he said, "I have no jurisdiction whatsoever. The title, the contents, the necessity for issue, are determined by the originating agency," meaning in this case the Federal Civil Defense Administration.

This pamphlet states many things. One of those is that it is loose or imaginary talk if you discuss a weapon called the superbomb, a hundred or a thousand times as powerful as the weapons under discussion.

Another point is that "radioactivity is less to be feared than burn and blast."

Dr. LAPP. What is the date of that?

Mr. ROBACK. I believe this was published in 1950, and this is the "best seller" at the Government Printing Office.

Mr. HOLIFIELD. Of course, the tragedy of this is that here is a document from a Government agency which is being distributed in terms of at least a million, to the people of the United States, and it is as out of date as a horse and buggy.

Dr. LAPP. My feeling here is that the tragedy is the lack of information of the people who wrote it. This is an indictment not only of the policies of information, but also, you might say, the atomic scientist. In developing these new weapons, they have far exceeded their original estimates.

Mr. HOLIFIELD. Let us correct this and put this exactly where it belongs. This came from the National Security Resources Board, Civil Defense Office.

Dr. LAPP. Yes.

Mr. HOLIFIELD. NSRB Document 130, published in 1950. And that was before the present Federal Civil Defense Agency was established.

Dr. LAPP. Mr. Holifield——

Mr. HOLIFIELD. But the point involved is that it is in print, it is for sale by the Government, it has not been stopped. It has not been revised. The American people are not being told the difference between the statements contained in this book and the realities that exist since the development of the thermonuclear bomb.

Dr. LAPP. Mr. Holifield, as I recall this now, I was shown this back in 1950, before it was published, and asked my opinion on it. I gave my opinion that it shouldn't be published.

Mr. HOLIFIELD. Here is something which I think ought to be read in the record; Mr. Roback started to read it. It is under the headline of "What About Superbombs?"

Do not be misled by loose talk of imaginary weapons a hundred or a thousand times as powerful. All cause destruction by exactly the same means, yet 1 20,000-ton bomb would not create nearly as much damage as 10,000 2-ton bombs dropped a little distance apart. This is because the larger bombs "waste" too much power near the center of the explosion. From the practical point of view, it doesn't matter whether a building near the center of the explosion is completely vaporized or whether it is simply knocked into a pile of rubble.

To be more specific, a modern atomic bomb can do heavy damage to houses and buildings roughly 2 miles away. But doubling its power will extend the range of damage to only about 2½ miles. In the same way, if there were a bomb 100 times as powerful, it would reach out only a little more than 4½, not 100 times as far.

And remember, all these calculations of your chances of survival assume that you have absolutely no advance warning of the attack.

So these are the statements that are now being distributed; the people are buying them and reading them and believing them.

Dr. LAPP. I think it is a pity they are currently being distributed; but it is certainly understandable that prior to the advent of the superweapon, such things could have been written.

Mr. HOLIFIELD. Yes. Certainly.

But that does not relieve the agencies which are responsible for the dissemination of the correct sources of information, and I include in that the Atomic Energy Commission and the Federal Civil Defense Agency, for taking such steps as are necessary either to stop this or put out the right kind of information, or to repudiate this type of information; take it out of the Government print shop.

Dr. LAPP. Absolutely.

The figures that I have listed in this table, I would like to repeat, are essentially maximum values. They are values you obtain for a flat, impermeable surface. Obviously, rain will cause some of the radioactive dust to go into the earth, thus reducing the radioactive hazard.

However, allowing for the high-yield weapons and for the vagaries of fallout, I consider the figures are adequate for planning purposes.

It would seem to me the Federal Civil Defense Administration ought to publish a table of representative values based upon proving ground data.

We come now——

Mr. HOLIFIELD. In other word, to get the official information to the American people from an official source.

Dr. LAPP. I think nothing in the area of civil defense can substitute for the Government's authentic data. There is, right now, in the literature of atomic energy, a complete spectrum of information.

Mr. HOLIFIELD. But it is dispersed among thousands of documents, and it needs to be brought together into one place and given an authoritative stamp, and given to the people on an up-to-date technological basis, and that has not been done.

Dr. LAPP. I would quite agree. I think that "The Effects of Atomic Weapons" booklet, which was published in 1950, was a step in the right direction, although in a sense it was much too technical in its nature. They went into far too much detail.

I would think that a much small book could be published which would be an adequate guide.

My own impression is: There are very few people in the country today who can understand much of what is in there.

Mr. HOLIFIELD. And it is out of date, anyhow.

Dr. LAPP. Yes; it is much out of date. I understand that book is being revised. I hope in the revision it will be possible for the people who publish it to make it meaningful to the largest possible number of civil defense people, for whom it is apparently intended, for when you put in abstract differential equations, it seems to me you are not helping people very much.

Mr. HOLIFIELD. We need information in simple language and remedial measures in simple language, which the ordinary lay person can understand, and leave the technical language to the scientists, but have that simple language which goes to the people accurate, and based upon accurate scientific knowledge.

Dr. LAPP. I quite agree.

Mr. BALWAN. You have a book on the effects of atomic weapons there which is an AEC publication; is that correct?

Dr. LAPP. I believe it is stated, I believe, it was prepared by the Atomic Energy Commission, but that Paul J. Larson, Director of the Civilian Mobilization Office, said the Civil Defense Office, the National Security Resources Board, commends this publication as a source of scientific information for technical personnel engaged in civil defense planning activities. It was prepared, I understand, by the Atomic Energy Commission.

Mr. BALWAN. Before you leave this persistence phase of it, am I correct that the only official thing coming from the Government, as long as you are talking about releases from the Government, is persistence for the first 36 hours?

Dr. LAPP. They have talked about—the February 15, 1955, release talked about the persistence in the first 36 hours. Dr. Libby has supplemented this, both in testimony before the Kefauver Subcommittee on Civil Defense and before your Subcommittee on Civil Defense; he has supplemented this by giving the t to the minus 1.2 law, which allows him to extrapolate it, but he did not give specific figures showing the dosage.

Mr. BALWAN. Assuming you would know how to use that formula, the public would have the——

Dr. LAPP. Yes. Here again, I think this would come back again to Mr. Holifield's observations. I do not think you want to inform the people with scientific formulas where they have to puzzle it out. I think you want to inform the people with some concrete, hard data.

Mr. BALWAN. This is not a criticism, though, of Dr. Libby's presentation of evidence from the scientist's point of view. There might be some other people who could popularize this in consumable form.

Dr. LAPP. I do not intend to criticize him on this page. I think you will find I have done quite the opposite.

Mr. ROBACK. When you refer to this 36-hour data, are you referring to the statement by Chairman Strauss of the AEC?

Dr. LAPP. Yes.

Mr. ROBACK. Are you familiar with this document? Have you looked at it recently?

Dr. LAPP. Yes.

Mr. ROBACK. Would you say, in your knowledge as a scientist and as a person who communicates to the public, this is a misleading document?

Dr. LAPP. It is not, overall, a misleading document. It provides useful information. But it certainly does not provide all the information you need and, in my opinion, it contains some information which is not true.

Mr. ROBACK. Does it contain information which might lead to untrue inferences?

Dr. LAPP. Well, I think one of the things here—I cannot find the exact point—but it implies, it states, that radioactivity—I am quoting now from my memory. They talk about the first 36 hours, and then they talk about the radioactivity thereafter as dying off quickly, implying there isn't much of a hazard.

Mr. HOLIFIELD. Let us find that and have that read into the record, please. It is in the first paragraph:

> The main radioactivity of fallout decreases very rapidly with time—for the most part, within the first hours after the explosion. An in-the-air explosion where the fireball does not touch the earth's surface does not produce any serious radiological fallout hazard.

Dr. LAPP. That is what I had in mind.

Mr. HOLIFIELD. That is the last part of the first paragraph.

Mr. ROBACK. Would it be common or, I mean, usual for a person, for a lay person, reading that to infer after 36 hours, radioactivity is not an important hazard?

Dr. LAPP. I think that would be the interpretation I would make as a lay person. I have commented specifically, by the way, on the accuracy of this overall thing, to the chairman of the Atomic Energy Committee, Senator Clinton P. Anderson.

Mr. HOLIFIELD. At the next to the bottom paragraph on page 4, it states:

> At a distance of 220 miles or more downwind, it is unlikely that any deaths would have occurred from radioactivity even if persons there had remained exposed up to 48 hours and had taken no safety measures.

Dr. LAPP. At that point, they were on the edge of the fallout; I think that is probably correct.

Mr. HOLIFIELD. But that does not necessarily mean if they stayed in that area and it was on the earth rather than on water, such as this pattern was on, why, the residual radioactivity would go beyond a 48-hour exposure, and then you would have the factor of cumulative radioactivity over days and weeks, would you not?

Dr. LAPP. Well, Mr. Holifield, one of the difficulties of dealing with this statement is that it is not a very precise statement, for example, just the technical problem, I had my own analysis of that which I made, and the technical problem of translating their decay rates is very awkward because of the language they use, and I had to make several different assumptions to get the answer. It was not very precise. So I must say that it is hard to comment on statements——

Mr. HOLIFIELD. Do you know any reason, from the standpoint of our national defense, why the full knowledge of the impact of nuclear weapons should not be made known to the American people?

Dr. LAPP. If we consider the effects of high-yield nuclear explosions, I see no reason why these data about the effects cannot be given

to the American people, for both the Russians and we have tested such weapons. They know what we do, and I don't think we are keeping anything secret from them.

Mr. HOLIFIELD. So to hide behind the wall of fancied national security in the revealing of weapon effects is, in my opinion, a very dangerous thing to do.

Dr. LAPP. In, I think it was, the May issue of the Bulletin of Atomic Scientists, in an editorial called "Fallout and Candor," I think I made my position quite clear, that I felt this was taking an enormous risk with the lives of the American people, not to tell them about the hazards involved, and in view of the nature of the past several years when apparently the risk of war was high sometimes; and the fact there was practically a delay of almost 1 year before the American people were given the information on fallout, I think that this does represent a lack of candor.

Mr. HOLIFIELD. And is it not impossible to have an adequate civilian defense unless this knowledge is made known to the people?

Dr. LAPP. I think this is probably at the core of the civil defense problem: That if the people do not know what to defend against, they will not have any real confidence that they can defend adequately. It will always be in the area that there is something they don't know. And that, to my way of thinking, is one of the basic problems in civil defense.

You have to instill confidence into your civil defense organization, confidence that you can do something.

Mr. HOLIFIELD. And the base of that confidence on the part of the people must be authoritative information which is directly pertaining to their chances of survival.

Dr. LAPP. Yes. I think this is a personal problem. They have to be convinced, and this—let's boil it right down to the very lowest local level. When you send out some kind of organizer or recruiter in the civil defense field, and he goes down to a local group meeting in a fire station, or something like that, and he is going to talk to them about these problems, that group will undoubtedly have 1 or 2 rather sharp people in it who will question some of the technical points brought up by the discussion leader.

That discussion leader has to be armed with some really good, simple facts, so that he can answer these questions and point to an authoritative source.

It is at that point, if he does not have the ability to answer the questions authoritatively, if he is improperly trained, does not have access to the facts, that you have a snapping of the link in civil defense, and it is the most important link, because it is the one closest to the communities.

Mr. HOLIFIELD. I have seen that very thing happen in my own community, where lecturers on civil defense were asked questions from the audience which they were not qualified to answer, and I have seen the audience turn, as you can sense an audience turning, completely away from dependence upon the speaker's ability to impart the knowledge needed.

Dr. LAPP. We have already—I would like to now talk briefly about the longer term hazard from superbombs, and we pointed out earlier the fact that when the uranium atom splits, it produces quite a number of different products, 3 dozen different chemical elements.

Of these chemical elements, 1 is strontium 90, and it has a half-life of 28 years. I am impressed with the testimony which Dr. Libby gave to this committee on January 31, 1956, with respect to the strontium hazard. I believe that Dr. Libby is to be commended for the interest he has taken in civil defense and for the data he has made available to the civil defense since he became a member of the Atomic Energy Commission.

There is little question but that global fallout from test explosions as conducted by the Atomic Energy Commission produces a negligible strontium fallout hazard. Civil defense, however, should be concerned with the local rather than the global fallout. If we condense the global area of fallout from the area of the globe, 200 million square miles, to 10,000 square miles, the area of local fallout, then the fallout dust obviously contains a vastly greater amount of radioactive strontium.

Mr. ROBACK. Dr. Lapp, on that point, are you stating that the use of these global figures which dilute, in effect, the impact, might be somewhat misleading with regard to the problem of civil defense?

Dr. LAPP. No, I did not make that statement. I merely—Dr. Libby testified because of his interest in Project Sunshine, which is the global measurement of radioactive strontium, Dr. Libby testified on the global aspect of radioactivity. This has been much in the news. The people have been concerned about it.

I am merely testifying that if you take the data he presented on the global fallout, and apply them to the local fallout, then I think you really have quite a problem. I have done that.

Mr. ROBACK. But the question was somewhat different. I was not making or casting any imputation on the testimony of Dr. Libby, but what I was asking was, are you limiting the usefulness of the data by generalizing to the globe rather than to the situation that might be concerned in a given target area?

Dr. LAPP. No. The data, I believe, are useful. Well, I might point out that I——

Mr. HOLIFIELD. May I ask the question in a different way, Dr. Lapp?

Dr. LAPP. Yes.

Mr. HOLIFIELD. When considered on the basis of global diffusion of strontium hazard as a result of our tests, Dr. Libby's testimony is quite valuable and, as far as we know, accurate.

Dr. LAPP. I would think there would be little question about the accuracy.

Mr. HOLIFIELD. Well, there is always a question, of course, when you are predicting it on a global scale.

Dr. LAPP. I think Dr. Libby is the acknowledged expert in the field of radio activity measurements.

Mr. HOLIFIELD. But a different condition obtains as to radiostrontium hazard in the area of a bomb burst over the ground.

Dr. LAPP. Yes, I think——

Mr. HOLIFIELD. And the residual radioactivity in the nature of radiostrontium-90 persists to an extent far different than that of the global formula.

Dr. LAPP. Oh, yes. I think this points out the difference of viewpoint. Dr Libby, as a member of the Atomic Energy Commission, is

keenly aware of the international repercussions of international fallout.

Mr. HOLIFIELD. And I think rightly so, and I think his testimony, in my opinion, was valuable because it helped to allay fears that the tests themselves have caused a concentration of strontium-90 to the point of possible genetic damage or other type of damage, and that he had to allay that particular fear, and I was very appreciative of his testimony on that.

Dr. LAPP. Well, not only that, but it permits the actual calculation of the local situation, and I did that, I made a calculation of the local strontium fallout. I won't go into these data, because they are rather technical and involve the millicuries per square meter, and so forth, but in just using Dr. Libby's criteria for the strontium hazard, I must state that, in my opinion, the local fallout strontium hazard is of serious dimensions.

Mr. ROBACK. From test explosives?

Dr. LAPP. No. From the actual bombing. If you had a bombing and you have a local fallout, I believe the radioactive strontium present in the local fallout, let's say in a corn field on a dairy farm, that this presents a problem which is thousands and thousands of times more intense than the fallout thousands of miles away, and I believe that we need more data on this.

I hope the Atomic Energy Commission will provide them, and I would like to see some specific measurements from the test operations given out.

Now, to turn to a little more constructive phase of this, this chart No. IV illustrates something in the nature of protection against the fallout.

This is rather diagrammatic. I did this in order to illustrate three different considerations in shielding.

This foxhole should have been a little bit smaller in dimensions in proportion to the other shelters, but let's just concentrate on this particular case.

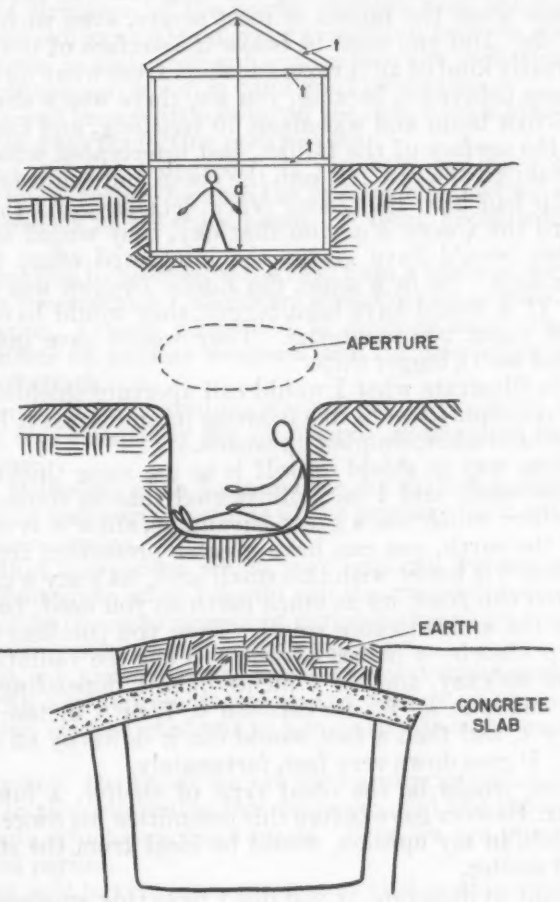
This is not a halo over the man deceased, or anything, but this is just meant to represent the area of the actual opening aperture of the foxhole.

Regarding this and focusing only upon a large field in which there would be a hole about so big, this man climbs into that foxhole when he knows there is going to be fallout. There is nothing above him whatsoever. The fallout comes down. We hope that he might put over a board or something. He could put a trenchcoat or a few papers to catch the dust. If he doesn't, it is too bad. But he does do one great thing. When he gets this small area overhead, he essentially eliminates all the danger as long as he stays in here; he eliminates all the danger from all the radioactivity which comes from here, here, and here [indicating].

This radioactivity which is out here goes off in all directions, down, up, in all directions, and some of it goes over here. If this man were to stand above the surface of the earth over here, he would then be exposed to the total effect of all the radiation all over the field. It is almost as if you had a field, to make an analogy, full of little lamp bulbs, and you had a photoelectric exposure meter. If you measured the intensity only on this many lamp bulbs, you would get a certain reading of intensity; if you turned on the next bank of lights and the next, you know that would integrate and would produce a greater reading.

CHART IV—FALLOUT: SHIELDING CONSIDERATIONS

FALL-OUT: SHIELDING CONSIDERATIONS



This nuclear radiation has its own way of adding up, and in such a situation as this, this man might get only about a few percent, depending upon the actual size of the foxhole, how the conditions were around here, how the dust swirled—only a few percent, 2 percent, of the dose he would get out here if he stood on the surface of the earth.

That is a factor of 50, so the dose he would get if it were 1,000 roentgens above ground inside he would only get 20 roentgens. In other words, from the standpoint of his life, he would have saved it.

This, then, is meant to illustrate that you do not need 3 feet of earth between you and the bomb; that you can survive the fallout effects even in a crude shelter such as this.

I do not propose that people spend long times in here, but for the initial phase when the fallout is most severe, even such a makeshift thing will do. But you must be below the surface of the earth.

This is really kind of an inverse situation from what we learned from the Japanese fishermen, because, you see, there was a ship which had about a 15-foot beam and was about 70 feet long, and that ship intercepted on the surface of the fallout, just intercepted what the area of the deck was; all the rest fell into the ocean and could not hurt them. If that ship had been the *Queen Mary*, let's say, and these men had been aboard the *Queen Mary* on that day, they would have all died, because they would have gotten the integrated effect from all the rest of the deck. So in a sense, the *Lucky Dragon* was lucky it was so small. If it would have been bigger, they would have died.

They got about 200 roentgens. They would have gotten a lethal dose if it had been a bigger ship.

That is to illustrate what I would call aperture shielding, and since it is a new concept, I would like to stress it, and stress it by showing a foxhole, as the crudest, simplest approach.

An obvious way to shield oneself is to use some thickness between you and the bomb, and I have illustrated that in connection with a surface shelter, which has a great advantage, since it is not above the surface of the earth, you can have greater protection from the blast. You can absorb it better with this small arch, let's say a concrete slab, and then you can stack up as much earth as you need, but bearing in mind, keep the arch distance small. Then you combine the effect of thickness to absorb—4 inches of soil will cut the radiation intensity in half, and let's say, another 3 inches of soil, depending on the soil, will again cut it in half. So between 6, 7, or 8 inches will cut the intensity by 4, and then a foot would cut it down by an additional 4 times 4, 16. It goes down very fast, fortunately.

This, then, would be the ideal type of shelter, a low occupancy shelter. Mr. Bascom gave before this committee his concept of a little shelter which, in my opinion, would be ideal from the standpoint of this type of shelter.

Now I want to illustrate, if you don't have this, suppose the ground is frozen and you don't have this, because you haven't spent the money in advance. Let's consider the more realistic situation of a house. This is a single-story house, and here we have, we actually have three types of shielding considerations. We have the thickness of the material itself, the floor material, the roof material, all of this, so that there is thickness shielding.

In addition, there is aperture shielding, because only that radioactivity which is on the roof looks in on you, and only that can hurt you.

But in addition, you have additional shielding, and that is distance between you and the source of radiation. You did not have that in the case of the foxhole because the radiation would have been right overhead. But in the case of the house you have distance.

So the combination of the three factors—distance, thickness, and aperture—gives you a fairly good degree, a surprising degree, of protection in the basement of that house. It does not give you the protection nearly as well on the first floor, but once you get down in the basement your protection increases; it will depend upon the dimensions and the structure of the house, perhaps even the angle of the roof. But one can say offhand, your protection here, in the basement of a brick home is such that you can reduce the radiation by up to a factor of a thousand, which is quite good protection.

If you take and have a little room off the side, a little kind of dugout, then, of course, your protection goes way up.

These, then, represent degrees. If you have a 2-story house, then your protection is better, because the radiation is farther away, your aperture is smaller in a 2-story house. A brick house would be even better.

I don't want this to be interpreted that I am a lobbyist for any of the Fairfax type construction. Ramblers would not be as good.

In conclusion, I have attempted to present some views on the secondary effects on nuclear weapons, and the possibility of survival in the event of attack.

Civil defense, in my opinion, started out on a "duck and cover" basis, which was essentially the philosophy emphasized in this booklet [indicating].

Governor Peterson, when he took over, he shifted to an evacuation policy, after he had seen the effects of the primary blast and heat from megaton class weapons.

I believe that this policy, which we might call pure evacuation, requires modification to what I would call the evacuation-to-shelter policy. It involves the construction of peripheral shelters and the make-do use of existing suburban shelters, structures.

May I add, my views are my own in this statement, and I have not consulted with any representative or any agency of the Government. And my views may be confined to a minority as small as that of one person.

Mr. HOLIFIELD. Dr. Lapp, we are very appreciative of the time you have given to this committee this morning, and the thought-provoking statements which you have made. Now we are going to have a little question period.

I think we will have a little question period at this time, and, Mrs. Griffiths, would you care to ask any?

Mrs. GRIFFITHS. I have no questions.

Mr. HOLIFIELD. Mr. Lipscomb?

Mr. LIPSCOMB. No questions.

Mr. ROBACK. Dr. Lapp, I would like to go over a certain question we discussed, with regard to the dosage.

Does it make a difference what dosages people bring to this situation? In other words, people differ in their history with regard to their exposure to X-rays and all kinds of radioactivity.

Dr. LAPP. I think it makes a difference, but the percentage of the population who would come into a fallout area with a previous medical therapeutic exposure would, I think, be quite small.

Mr. ROBACK. Well, is there any way of determining what that exposure is, cumulatively?

Dr. LAPP. The person himself probably would have no knowledge, unless he had a very special interest. If you went to a doctor to have a series of X-rays taken for, let's say, gastrointestinal series, I doubt very much if you would know how many roentgens you had, and that would be only over part of the body.

All through our discussion we talked about total body radiation. You obviously can get much greater radiation of the hand than you can of the total body. In a sense, it is similar to a burn. You can burn a finger and not die, but burn the whole body and you are quite in different circumstances.

Mr. ROBACK. These laboratory workers in places where there is exposure, do they not tally, so to speak, their exposure?

Dr. LAPP. These are tallied for them. The workers of the Atomic Energy Commission are very well protected by a special health physics type of survey and accounting. Every worker, for example, who is going to be exposed to any radiation has a number of devices which are used, and often worn on him, such as a photographic film, such as an ion chamber. a pocket meter, so that he actually carries a record. When he leaves the Oak Ridge plant at night, this instrument is taken up at the gate, and they record later how much radiation he got.

In addition, surveys are made of the places where he would work, to determine that there are not hazardous conditions existing there.

Mr. ROBACK. In view of the uneven incidence of radiation during a bomb burst, and varying rates, varying kinds of exposure, would it follow that an attribute or a feature of the civil defense program ought to be some system for keeping records on people's exposure?

Dr. LAPP. Well, I think that a radiation history is very desirable, and it is a question of how you are going to keep it. It requires instruments to know what the dose was, so we come back to Mrs. Griffiths' point, that you have to have the instruments.

Mr. ROBACK. Those are not the instruments that an individual himself would necessarily use?

Dr. LAPP. Oh, yes, in some cases, if you wanted to, you could use instruments—you don't have to have one for every person; every household. Perhaps one house per block would serve as the kind of guide to conditions you would have in a block.

As a minimum, I would say you would have to have one person per block who has some knowledge of instruments.

Some of these instruments are extremely simple to read. These little pocket meters cost less than $10.

Mr. ROBACK. But do they measure—I mean, do they give you some kind of measure of exposure of the individual?

Dr. LAPP. Oh, yes. Unfortunately, in my hurry to get over here this morning, I left my own at home. But I took the risk of coming over here to Capitol Hill without it.

This instrument constantly measures the amount, and I look at it occasionally to see what it is. I have had this instrument since Christmas of the year before last, without recharging it. I don't even have a charger. I have to go off to some laboratory and have it charged.

This instrument is very reliable. I drop it on the floor, as I have several times, dunk it in water, and it does not discharge. It is kind of a foolproof instrument.

I understand the Federal Civil Defense Administration is buying a number of thousands of these, and I think it is a good idea. This is the quartz fiber pocket chamber—does anybody have one here?

Mr. HOLIFIELD. We had it demonstrated here. It is the fountain pen type.

Dr. LAPP. It is the fountain pen type. You can use that not only as an indicator of how much you have got, but supposing you were in a basement and you were to have the explosion go off. You could take this thing and tie it on the end of a string and throw it on the lawn, leave it out for ten minutes, and then drag it back, and then you could record what the rate was in those ten minutes.

Now, it is a makeshift thing, but you can do it. I would do it.

Mr. ROBACK. In terms of conventional panic, disaster conditions, one might say women and children first. Now, the thought has been expressed——

Dr. LAPP. First. You mean let them get more radiation? [Laughter.]

Mr. ROBACK. Let them get more protection.

But the thought is either explicit or implicit in some of the testimony that people ought to be protected or saved on the basis of their relative minimal exposure, rather than on the basis of whether they are young or old or able to move.

Dr. LAPP. You mean in case you have the area fallout, and you are trying to deal with the medical problem, the man who has 500 roentgens, do you try to treat him?

Mr. ROBACK. Let's say a child has 400 roentgens as against an ablebodied worker who has 200.

Dr. LAPP. People with 400 roentgens, I am afraid, if I consider the kind of chaos which would be involved following any kind of attack, which would obviously not be with one weapon (equivalent to kicking a giant in the shins), but would be with a multiplicity of weapons, with overlapping fallout areas, with a diffuse kind of situation, I would say that your problem of medical relief would focus upon those whom you could hope to help with a minimum of assistance.

You would not go into cases which required extensive transfusions and enormous hospital-type aid. For one reason, you simply cannot rely upon such facilities being available. You have got to consider the first week, in my opinion, the first week of this disaster is a week in which you simply try to ride out the storm. The concept of what you would call rescue operations after the bomb goes off, you organize groups and they take people out. I think that concept is dependent upon the evaluation of the radioactive fallout peril.

Mr. HOLIFIELD. Mr. Balwan?

Mr. BALWAN. No questions.

Mr. HOLIFIELD. Thank you very much, Dr. Lapp, for your testimony today.

(Whereupon, at 12:05 p. m., the subcommittee adjourned.)

CIVIL DEFENSE FOR NATIONAL SURVIVAL

THURSDAY, MARCH 22, 1956

HOUSE OF REPRESENTATIVES,
SUBCOMMITTEE ON MILITARY OPERATIONS
OF THE COMMITTEE ON GOVERNMENT OPERATIONS,
Washington, D. C.

The subcommittee met at 10 a. m., in room 1501, New House Office Building, Hon. Chet Holifield (chairman of the subcommittee) presiding.

Present: Representatives Holifield (chairman), and Lipscomb.

Also present: Michael P. Balwan, staff director; Herbert Roback, director of investigations; Earl J. Morgan; James F. Eckhart, Robert J. McElroy of the subcommittee staff; and Carey Brewer, Legislative Reference Service, Library of Congress.

Mr. HOLIFIELD. We are honored this morning to have before us representatives from the Department of Health, Education, and Welfare and the subject of the testimony will be the delegations of duties from the Federal Civil Defense Administration. We have quite a number of distinguished witnesses here this morning and we may not be able to get to all of them, but we will do the best we can with the time available to the committee and to those that we fail to get to, we will ask them to file their statements in the record, if they have a prepared statement.

Our first witness this morning is Mr. Dean Snyder, Defense Coordinator, Office of the Assistant Secretary of Health, Education, and Welfare for Federal-State Relations. And Mr. Snyder, we are happy to have you with us this morning. We understand you have a prepared statement and you may now proceed to give the committee your statement.

STATEMENT OF DEAN SNYDER, DEFENSE COORDINATOR, OFFICE OF ASSISTANT SECRETARY OF HEALTH, EDUCATION, AND WELFARE FOR FEDERAL-STATE RELATIONS

Mr. SNYDER. Mr. Chairman, this is in order to provide briefly a setting and a continuity for the departmental testimony which will follow. It is a very short statement, which I would like to offer at this time.

Mr. Chairman and members of the committee, representatives of the Department of Health, Education, and Welfare are here this morning at the committee's invitation to discuss civil defense responsibilities assigned to the Department by the Federal Civil Defense Administration.

This is familiarly known as the "delegation program" and rests upon authority contained in section 201(b) of the Federal Civil Defense Act of 1950 (Public Law 920, 81st Congress).

All of the delegated assignments to the Department are contained within an FCDA document known as delegation No. 1, dated July 14, 1954, and you have copies of that in your book.

This document recognizes that we have specialized, professional competency—including research facilities—in Health, Welfare, Education, and Food and Drug Administration which can and should be put to work in connection with the defense program.

Mr. ROBACK. Mr. Snyder, who recognized that? You say this document recognized that. Did the Department of Health, Education, and Welfare recognize that or did the FCDA recognize it?

Mr. SNYDER. We both recognized it because in the framing of the original document there were many conferences which preceded the document itself in which this recognition was a part of our mutual discussions.

Mr. ROBACK. When was the Department first apprised of the fact of the delegation or of the imminence of the delegation?

Mr. SNYDER. The delegation was dated July 14, 1954, and my own recollection is that our negotiations went forward beginning in November or December of 1953, which led up to the delegation, but there had been for several years prior to that in a number of instances by departmental, Public Health Service and other operating officials, recognition and insistence as to the need of this kind of delegation.

Mr. ROBACK. Did you advise the FCDA that there ought to be a delegation or did you advise them that you ought to have it?

Mr. SNYDER. There was a mutual recognition, but we pressed very hard for the recognition of this principle.

Mr. ROBACK. Is it fair to say that you initiated this delegation?

Mr. SNYDER. I would rather say that it resulted from mutual discussion and say that we emphasized as strongly as we could the need for it and the need for making ready for it, so much so that when the delegation was finished and finally issued we were ready immediately with a list of projects that we felt were essential to be done under the document.

Mr. HOLIFIELD. You may proceed.

Mr. SNYDER. The Federal Civil Defense Administration could not hope to match this competency without creating in effect, duplicate facilities and staff in all these fields. In addition to this, we are able to utilize our regional structure and our accustomed Federal-State-local channels and relationships which have developed out of many years of experience in our regular programs. This is another existing resource that FCDA could not hope to duplicate.

Through this policy of delegated responsibilities—using well-defined, existing structure—our civil defense delegations can be "built-in" as a logical extension of the activities of various officials at all levels of Government who are accustomed to work together in peacetime operations.

Under this "built-in" concept of preparedness we have willingly accepted our delegated responsibilities and done our utmost in making them effective within the limits of available resources. At your invitation, we are glad to report on what has been done thus far.

The principal testimony will be given by the Surgeon General of the Public Health Service and by representatives of the Commissioner of Food and Drugs, the Commissioner of Social Security, and the Commissioner of Education.

However, before hearing these witnesses, I should point out that delegation No. 1, in its entirety, covers a series of eight program assignments which have, in turn, been redelegated by departmental order to appropriate operating agencies within the Department.

Each of these presupposes the development of national plans and the development and provision of technical guidance to the States in the several specialized areas.

These program assignments may be paraphrased in short form somewhat as follows—I have listed them here with a citation in each case to the part of the delegation to which the item refers:

To the Public Health Service:

Research and methods for detection, identification, and control of communicable diseases, biological and chemical warfare against civilians, and other public health hazards, and technical guidance to States with respect to these matters (delegation item 3).

Recruitment and training of mobile Public Health Service Reserve personnel to be assigned to attacked areas (delegation item 4).

Technical guidance for emergency restoration of community health facilities (item 7); and for shelter and protective measures for hospitals, and water, sewer, and other public health facilities (delegation item 6).

To the Food and Drug Administration:

Provision, including research, for extraordinary food and drug inspection and control measures in attacked areas (delegation item 8).

To the Social Security Administration:

Temporary financial assistance to civilians injured or in need as the result of attack (delegation item 1).

Clothing for civilians in need as the result of attack (delegation item 2).

To the Office of Education:

Development and distribution of training materials in civil-defense knowledge, skills, and behavior for school curriculum use (delegation item 5).

Technical guidance for shelter and protective measures for schools (delegation item 6).

For the Department as a whole, the Assistant Secretary for Federal-State Relations coordinates all defense activities, including the delegations program.

The foregoing statement is to give the general setting and framework of delegation No. 1 as it applies to the Department. The testimony will now be carried forward in detail by the Surgeon General, Dr. Leonard A. Scheele, who will discuss with you the civil-defense work of the Public Health Service. He will be followed by other witnesses who will discuss the civil defense work of other segments of the Department.

Dr. Scheele.

Mr. HOLIFIELD. Thank you, Mr. Snyder. Are there any questions of Mr. Snyder's introductory statement here?

If not, we will proceed with the detailed explanation. Dr. Scheele?

STATEMENT OF DR. LEONARD A. SCHEELE, SURGEON GENERAL, PUBLIC HEALTH SERVICE; ACCOMPANIED BY DR. W. PALMER DEARING, DEPUTY SURGEON GENERAL; DR. JOHN B. HOZIER, CHIEF, HEALTH EMERGENCY PLANNING; AND DR. HOWARD ANDREWS, HEAD, GENERAL RADIOBIOLOGY SECTION, LABORATORY OF PHYSIOLOGY, NATIONAL CANCER INSTITUTE, NATIONAL INSTITUTES OF HEALTH

Dr. SCHEELE. Mr. Chairman, members of the committee, and staff, I am very glad to have this opportunity to outline for you the role of the Public Health Service in civil defense. We appreciate the magnitude of the task which you have undertaken in attempting to evaluate and to improve the civil-defense program for the country, and we offer you our assistance toward that goal.

The Public Health Service is the principal health agency of the Federal Government. That is with reference to dealing with broad civilian health problems as contrasted with the medical problems of the Veterans' Administration and medical problems of our Armed Forces.

Our basic peacetime programs are aimed at maintaining and improving the health of the American people.

Under circumstances of enemy attack our responsibility does not change, but public health problems assume greater dimensions and the difficulties in accomplishing our mission are likewise increased.

I need not go into details with your committee on the chaotic conditions which would follow a widespread nuclear weapon attack on this country. We must expect, in addition to the direct casualty effects of modern weapons, a serious breakdown of our modern heating, water supply, waste disposal, refrigeration and other food protection facilities.

There will be dislocation and movement of large segments of the population and consequent lowering of living standards, creation of abnormal epidemic hazards, and a requirement for post-attack health service for great numbers of people.

The programs of the Public Health Service are cooperative ones. Our primary functions are technical, advisory, consultative, and supportive.

I am speaking of our normal peacetime role and our normal method of operation.

We do not, for example, provide health care for all citizens. This is the responsibility of private practitioners of medicine, of local and State health departments, and of private and public hospital and medical facilities.

The Service provides scientific and technical guidance and information to operating agencies; it conducts extensive research to provide new and improved methods of countering the natural and man-made ills to which the country may be subjected, and it furnishes skilled personnel to assist in the localities which need this help.

This chart shows the Public Health Service system and its physical resources in administrative and operational facilities.

We have attempted to show you some of the offices and some of the activities with which the Public Health Service is concerned.

The red dots indicate our principal administrative offices. These are regional offices of the Department in which we have public health staff. There are nine regional offices. This chart also shows the boundaries of the DHEW regions. The Public Health Service has staff in all 9 of these but we have comprehensive staff in 8.

Mr. BALWAN. Do these regions, Dr. Scheele, correspond in any way to the Federal Civil Defense Administration regions?

Dr. SCHEELE. I regret to say that they do not. Our regions are not coterminous with the FCDA or with the Department of Defense lines.

Mr. BALWAN. Is there some agreement whereby the FCDA or your regional directors know which FCDA director to get to?

Dr. SCHEELE. Yes. We have good working arrangements in that regard. Actually, as you probably are aware, Dr. Whitney is the medical chief in FCDA in Battle Creek. Dr. Whitney, I see, is here this morning. He is a Public Health Service commissioned officer on loan to the FCDA, and the bulk of the health staff, including the staff they have in their regional offices, in their field offices, are Public Health Service personnel on assignment. So we have a very special reason to work in close cooperation. Our regional staff and their regional staff work very intimately together. I see no problems in that regard other than the fact that, under attack conditions with difficulties in communications, obviously people—one group having a supporting role for another operating group—would have extra difficulties by virtue of being in different cities in most instances.

Mr. BALWAN. Thank you.

Mr. MORGAN. Dr. Scheele, are these medical officers on loan to FCDA carried on your budget or FCDA's budget?

Dr. SCHEELE. They are carried on our budget but we are reimbursed by FCDA. We send them the paychecks but it is money that is obtained from FCDA by reimbursement to us.

Mr. MORGAN. Is this under their delegation of responsibilities or is it under their separate budget?

Dr. SCHEELE. No, sir. This is a part of their standard operation and was going on before we had a delegation. This is the standard method of operating. Public Health Service staffs various Federal agencies for various medical services that are going on now. When on loan our men are under the head of the agency they are working in.

Our men assigned to Federal prisons report to Mr. Bennett, the head of that program. We are staffing a great variety of operations in the health field. In the State Department, ICA, the technical assistance program, here again the same pattern of operation is carried on. We give them personnel and they reimburse us. This is a standard operation within the law and is not necessarily related to delegation.

Mr. MORGAN. The reason for this question, Mr. Chairman, is to point out that this particular function is not affected by any fluctuation of budget provided to FCDA for their delegation of responsibilities.

Dr. SCHEELE. That is correct. I might say that our own experience with civil defense and this pattern of operation began during the period of World War II when Dr. George Baehr was the Director of the Medical Division of the Office of Civilian Defense. He was a Public Health Service reserve officer who came to active duty and who was assigned to head that program.

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As a matter of fact, Dr. W. Palmer Dearing, who is Deputy Surgeon General, was the deputy in that operation during World War II, and I spent a number of months myself assigned to the OCD of those days. This was the standard type operation.

The same thing was done at that time. The advantage of this type operation in health programs in the Government lies in the fact that by this device agencies which may not themselves have extensive medical staffs and large numbers of specialists in a series of fields have the whole Public Health Service to draw on.

They can come to us and, because we have such a comprehensive program, can draw from the storehouse of knowledge and skills of our people on a consulting basis and not necessarily on a pay-for-service basis for all the help we give.

We have done things for FCDA long before we had a delegation. In fact, we were doing things in the civil-defense field before FCDA came into existence under the law.

We think this is a very ideal arrangement which avoids diffusion in the sense of building up a lot of independent health programs. It tends to provide for better coordination and understanding between agencies and for implementation of programs at minimal expense in terms of acquisition of manpower, because medical and some of the scientific health manpower is scarce and very hard to get in the country as a whole but especially scarce in the Government.

This is a conservative method of operating.

Mr. HOLIFIELD. It would also tend to furnish personnel who had been adequately cleared as to competency by standards which are well recognized in your department.

Dr. SCHEELE. That is correct because we tailor make for any particular job. Dr. Ed Williams, who handles medical radiation problems in FCDA, for example, is one of our men who has had wide experience and training in those broad fields in the Public Health Service before he was loaned to FCDA.

Mr. HOLIFIELD. It should cut down administrative expense, it would seem, because your general administrative setup would take care of the recruiting and assigning of the teams and the relieving of people and replacing and all that sort of thing.

Dr. SCHEELE. That is true but probably in total, because of the small numbers of people involved, it is not a very large saving. We do have, I will mention later, a reserve officer recruitment program which is to build up a civil-defense reserve. That program is supported by some of the transferred funds we get from FCDA.

There is another thing which makes our program, I think, valuable to the other Government agencies and to FCDA, and that is the fact that we operate with two personnel systems in the Public Health Service.

We operate with the normal civil-service system, but, in addition to that, we have a commissioned career system which is patterned after the Army, Navy, Air Force, Coast Guard, and Coast and Geodetic Survey, the uniformed services. Our people employed within the commissioned services are principally our professional staff people, doctors, sanitary engineers, nurses, and others. The pay scales are the same, the rank scales are the same in all uniformed services. The terms of employment in a sense are to serve at any time, any place, as

exigencies demand. That gives us a mobile force which has many advantages.

It made it simple during World War II for Dr. Baehr, when he wanted to reorganize the health operations of the regional office in San Francisco, to call me in one day an say, "Scheele, you are going out to San Francisco." We say, "Yes, sir," and that is it. Of course, we are not arbitrary in the movement of our people. We try to take into account their personal problems, children and schools and the rest of these things, but it does enable us to do a better job because we do have this opportunity for movement, for shifting, and those who work in the commissioned corps of the Public Health Service anticipate that. This is the rule and they are prepared for it.

So this does provide a sort of mobility. We can sometimes place people on jobs that it would be hard to fill on a continuing basis. For example, to overseas assignments in the technical assistance field. It is difficult to get key Public Health people to go abroad for 6, 8, 9, 10 years; on the other hand, if one sends them over for 2-year tours, they are usually happy to go over and they don't feel they have lost contact back here.

We have many advantages in this. I think this is especially applicable in the type of situation we would find ourselves in if we were attacked by an enemy and had to mobilize to meet that attack on the health front. I am not suggesting that we organize all other Government personnel operations that way. But I do point out that this circumstance of having a commissioned career system in the Public Health Service does enhance opportunities to carry on a civil defense program on a larger scale if we have to mobilize them.

Mr. ROBACK. Dr. Scheele, may I ask in connection with your responsibilities here, do you operate under a specific statute regarding public health?

Dr. SCHEELE. Yes.

Mr. ROBACK. In the event you did not have a delegation of authority from the FCDA, in a sense would you not have carried on the activities that you are now carrying on?

Dr. SCHEELE. There are many of our normal activities in the Public Health Service which are not distinguishable as activities required to improve health for reasons of civil defense or reasons of just normal operations in the health field.

We are interested in sanitation for example.

We want good sanitation no matter what the circumstance is. If we have a natural disaster, or if we have a man-created disaster, enemy-created in this instance, obviously there are problems in PHS as well as FCDA.

Bacilli which might contaminate a water supply or food supply are typhoid bacilli if it is a little epidemic which occurred in Michigan after a supper when somebody accidentally contaminated some food or if it is another outbreak they are enemy-inspired. There are many things we do, which, depending upon how one wants to look on our total program, have civil defense value and we do them anyway.

Mr. ROBACK. Do you understand that you have received some substantive addition of authority in the delegation that you did not possess?

Dr. SCHEELE. Yes, I think we have, because the other thing I was going to say which really is the more direct answer to your question is that it makes us do many things which we wouldn't otherwise do.

Mr. MORGAN. Because of lack of funds or lack of manpower?

Mr. ROBACK. Lack of authority is implied in the answer.

Dr. SCHEELE. It is lack of both, but it is also the fact that there are so many things to do in the health field that there is always a debatable question of how much a Government agency should do. It is going to be a long time before we solve some disease problems. On the other hand we hope our attack on heart problems and cancer problems will bring us some early answers too. I think it is more a matter of desire to do a major program. Then we have to decide how much of it is to be a civil defense program.

Some of these things that we do we do under the delegation and the funds that are transferred from FCDA now are things which we wouldn't necessarily in the ordinary course of peacetime events consider of high enough priority to undertake within our regular budget.

We would rather use our staff for other things if we had a choice. So if we make a national determination that we must have a civil-defense program, then we also make a determination that we look at what we are doing, we look at gap areas and attempt, within some limits, somewhat arbitrary, because one can't do all things right at once, to select those things which seem like the most important gaps to try to fill to make that civil-defense operation a more successful one.

Mr. ROBACK. Isn't it a fact that from here on out radiological problems are going to become a peacetime concern regardless of civil defense? You will have all kinds of industrial safety and health problems.

Dr. SCHEELE. Yes.

Mr. ROBACK. So in the ordinary course you would have some kind of obligation to get into the middle of that field?

Dr. SCHEELE. Yes, sir. We have a staff in the Public Health Service concerned with those problems.

Mr. HOLIFIELD. But if the FCDA is particularly interested in that field, they might accentuate your work and enlarge your work by transferring to you additional funds that you would not have to enable you to do that?

Dr. SCHEELE. That's right.

Mr. HOLIFIELD. That is essentially what happens?

Dr. SCHEELE. That's right.

Mr. HOLIFIELD. Your extracurricular duties, which is the accentuating of extra duties does depend on the request of the FCDA and the furnishing of funds to you to do that work?

Dr. SCHEELE. That is correct.

Mr. HOLIFIELD. We want to explore just how much funds have been requested by you on your own, how much have been requested by the Federal Civil Defense Administration to do these extra duties and how much has been granted to you and how much you have spent. These are some of the things we will want to determine this morning.

Dr. SCHEELE. If I might give you just one example, since we are diverting from the statement, we are interested in rapid lab identification of bacteria of various kinds in the course of ordinary events.

On the other hand, we know that when certain diseases occur on a fairly sporadic basis, that is when here and there there is a case, and you don't have large numbers of people who are immediately affected, then the real necessity for being able to make a diagnosis in 5 hours, 12 hours, 24 hours isn't great.

In a situation in which an enemy might be using biological weapons, where in a very short time or a matter of seconds or minutes or hours large segments of the population might be exposed to a pathogenic agent, it becomes exceedingly important to do rapid identification. This is one example of a build up in program, one of the things we have been doing under our delegation and with some of the transferred funds. We are working on a speed up of tests and then working on the training. You can have better tests but unless you have people around the country who have been trained to perform the tests, we haven't gained a great deal, we haven't gained the time advantage which we have to have.

This, for example, is a manual which we are using in our training program which incorporates some of the improved techniques that have been developed and suggestions of the use of other existing techniques on a standard basis. In one of our series of dots here we have—the yellow dots, you will see there are a substantial number.

This is a program that we have worked on and organized with a twofold purpose in mind. We are interested, for example, in influenza.

If influenza should become epidemic again in our country as it was during the late period of World War I, we would be most anxious to make an early recognition of this growing problem and identify the strain of influenza virus that is extant at this time. We can make a vaccine but it has to be tailored for the strain. Those who are in this program of sectional labs are unusually competent. These are labs that can do the most extensive series of tests, not the average lab, these have major importance even in peacetime.

But in the event of enemy attack with biological agents these same labs then become a resource to do the determinations of what our problem is. And they would be the keys then for the development of the defense program against particular agent or agents that might have been used.

This is the type of stepup that we carry on because of the determination that we must improve our ability to cope with enemy attacks should they come.

Mr. MORGAN. Dr. Scheele, are you doing any work or studies in the radiological field?

Dr. SCHEELE. Yes. We are doing studies in that field and we have been involved in that field for a considerable period of time with the Atomic Energy Commission.

Mr. MORGAN. Are you doing any work in that field under your delegation from FCDA?

Dr. SCHEELE. We are not at present.

That work is being handled directly by FCDA. I would point out that many of the things we are doing are valuable to FCDA. For example, we have been working under contract with AEC on fallout during the various tests. We will probably do so in forthcoming series, through continental monitoring as against monitoring 200 miles from the test site, monitoring of a type we have not been doing in the past.

We have called some of our engineers to active duty, 20 to 30 each year over the years to do the Nevada test offsite monitoring program, giving those men 1 to 4 months' experience in the field. The experience they took back and translated into the civil defense programs because our State health officials in our States are the men who for the most part have been designated by the governors and State legislatures as the health arm of civil defense. While this program is an AEC program which the Public Health Service is doing on a contract basis we are in fact enhancing the abilities of our State and local health officials to understand the problems and cope with them if they had to operate in a civil defense emergency.

Mr. HOLIFIELD. Is that function quite an important function in scope or not?

Dr. SCHEELE. Yes, it is one which is becoming increasingly important.

As was pointed out, that is true with the decision to move fairly rapidly in the field of peaceful use of atomic energy as a power source and the beginning approval of power reactors as well as the start of the program of establishment of research reactors in universities for a variety of purposes.

We have two that are already approved by AEC, one at New England Deaconess Hospital in Boston and I believe another one at University of California. Possibly many of our medical schools will have atomic reactors for health research and treatment.

It has led the Public Health Service to building up this particular activity, especially training, in our own normal operation. We do relatively little with our own hands in the Public Health Service in the way of activity out in the State and local community.

Our job is to help strengthen State and local agencies.

Mr. HOLIFIELD. Is that mostly in the form of furnishing advice to the State agencies on a consultative basis and information which you have developed from your research labs?

Dr. SCHEELE. Yes, sir, that is correct. Then we carry on another function in our sanitary engineering center in Cincinnati, Ohio.

We have developed an extensive training program and we have brought in not only those who are in health departments but some of the folks who have civil-defense interests in the radiation field for on-the-spot training programs in the use of monitoring equipment. These programs include the upkeep of instruments and the interpretation of the readings. When one gets the terms of what all these things mean, we realize that you can't say it has civil-defense implications only, it has peacetime atomic energy use implications, as well.

Mr. HOLIFIELD. Do you have close liaison with the research work being done at AEC labs like the Argonne lab in the field of radiation and its effects?

Dr. SCHEELE. Yes; some of the work being done is carried on by members of our staff. We have men on loan to AEC and some of the work is with their contractors.

Mr. HOLIFIELD. There is no obstruction in the flow of information from regular AEC research personnel to your research personnel? There is a complete exchange in this field?

Dr. SCHEELE. That's right.

Mr. HOLIFIELD. And it has made available to the State levels without any obstruction this information?

Dr. SCHEELE. That is essentially true. We don't feel there is a problem. In terms of potential for flow of information, there are no great problems. There are some very serious problems on another front, however, which effectively mean that the flow of information doesn't mean much sometimes. One of these problems is scarcity of adequately trained personnel in radiological defense in the public health service and in our State and local health services.

Mr. HOLIFIELD. You are speaking now of lack of an adequate force of personnel in your own department to do the job and do it properly?

Dr. SCHEELE. That is correct.

Mr. HOLIFIELD. You are also speaking of a lack of personnel on the State levels to receive this information and effectively use it?

Dr. SCHEELE. That's right. This area is one of the areas which I wouldn't say is of less importance but in terms of the priorities for work by health officials and related to staff and budget, this activity is a relatively new one. It is one that, in their standard method of operation, is not going to cause them to drop their milk sanitation program in favor of diverting those funds to the procurement of biophysicists, health physicists and maybe an electronics man and the kinds of people they need to do this other operation.

Whether or not they are doing anything depends on several things. It depends on how well they have recognized and sold to their budget authorities and their State legislatures programs with full-time people and how successful they have been in getting money for peacetime activity and how successful they have been in selling concepts of civil defense.

Mr. HOLIFIELD. This is one point on which we want you to be very frank with us today. So often the witness from the Department will tell us the things that they are doing all of which are justifiable and all of which we commend, but so often the impression is left that they are actually covering the problem that needs to be covered. We hope in the presentation of this testimony you will be very frank with this committee and tell us the degree of effectiveness your program has in covering the possible need in case of enemy attack.

If it is 5 percent or 2 percent or 40 percent or 50 percent we would like to know. Because our problem is to try to evaluate the civil-defense capability as it is now. Telling us of a service that you render without telling us the degree of service which is needed is merely beclouding the issue.

In order for this committee to effectively evaluate the situation we must know what is needed. If you have asked for funds and they have been denied by the Congress, if they have been denied by administrative action in the Budget Bureau, if they have been denied in the FCDA in relation to the delegated authority and its obligations on your department, this we want to know in your testimony today.

Dr. SCHEELE. We will be really frank with you as we go along.

Mr. HOLIFIELD. We don't want to tell the American people that they are covered on these hazards unless they really are.

Dr. SCHEELE. We might say here now, Mr. Chairman, that we certainly are a long way from covered. We have a program under our delegated authority and responsibilities but naturally in terms of readi-

ness to cope with wide-scaled attack with nuclear weapons we are woefully unprepared.

Mr. HOLIFIELD. We appreciate that testimony because the testimony which has been given before this committee to date certainly bears up your statement that we are facing a hazard which the world has never faced before in this radioactive danger, the pattern of it, the scope of it over thousands of square miles in the case of an enemy attack, and the effect of this almost new and practically unknown danger on the human organisms and it is very important I think that the American people understand what nuclear warfare will mean.

If they do understand it I think they will be willing to support a program which is effective but if they are under any illusions that they are being protected when they are not, there won't be that willingness to support a program which we feel should be in existence.

You may proceed.

Mr. MORGAN. I have another question.

Mr. HOLIFIELD. Mr. Morgan.

Mr. MORGAN. Is it your understanding that under your first delegation here listed by Mr. Snyder that this does not include research into methods of identification in the field of radioactivity and its effects?

Dr. SCHEELE. That is correct, as far as the delegation goes. But that does not preclude us under our regular operating authority and Public Law 410 of the 78th Congress from being concerned in this field.

Mr. MORGAN. I understand that. I would like to refer to the language of this initial delegation in which it says:

> Plan a national program, develop technical guidance for States, and direct Federal civil-defense activities concerned with research with respect to, and detection, identification, and control of (1) communicable diseases in humans, (2) biological warfare against humans, (3) chemical warfare against humans, and (4) other public health hazards.

I was wondering whether this "other public health hazards" was better clarified by FCDA or this is an assumption that PHS has been operating under that they did not have authority to go into this field.

Dr. SCHEELE. We don't consider that this "other public health hazards" could be a tent that would necessarily cover in broad scale the radiation problems.

Our reason for saying that is in our intimate work with the officials of FCDA who are concerned with the total health programing and the program in the radiation field, they are set up and doing that program. That isn't one that they necessarily have intended, up to this time, at least for us to carry out as a special program for them.

As we said before, any work we do in decontamination of water supplies or disposal of radioactive wastes or detection obviously is of value to them as it is of value to our State health and local health officials, too.

But we don't consider that we have a broad mandate to develop a program on behalf of FCDA in this field as we do in biological and chemical areas.

Mr. HOLIFIELD. But you do have separate contracts with the AEC, do you not to work in that specific field of radioactivity?

Dr. SCHEELE. Yes, sir, that is correct.

Mr. HOLIFIELD. And that information obtained in that field would be available under the general language of other public health hazards to the FCDA, would it not?

Dr. SCHEELE. Yes, our information is all freely available. Of course if we do work for the Department of Defense and do work for AEC, as their contractor, obviously the information we give them is theirs. My impression from our own broad-working relationships, and I don't have this directly from anyone's mouth directly in FCDA, is that AEC and the Department of Defense, the two principal agencies that would have a great deal of information available in these fields have made their data freely available to those Government agencies that needed to know those things. They have made them available to us and I'm sure they have done so to FCDA. This work is not lost. This is available in planning.

Mr. HOLIFIELD. You spoke a moment ago of your training program. How many people have you given special training in the field of taking care of mass casualties in case of enemy attack?

Dr. SCHEELE. The program on mass casualty care is operated directly through the FCDA structure and this is not one of our delegated responsibilities.

Mr. HOLIFIELD. You would only advise, you might say, the instructors or the top people on a consultative basis in the preparation maybe of training guides?

Dr. SCHEELE. Yes, sir.

Mr. HOLIFIELD. But you would not participate as an operational agency in that field?

Dr. SCHEELE. That is correct.

Mr. BREWER. Are they not Public Health Service officers?

Dr. SCHEELE. Yes. They are in FCDA. We have helped them in the development of training materials but we have not operated programs on training State and local officials.

Mr. HOLIFIELD. Then you couldn't testify about the extent of the training done by FCDA in this area?

Dr. SCHEELE. No, I couldn't.

Mr. ROBACK. The question has been raised several times about the relationships with the AEC. It has been represented to the subcommittee staff that when certain tests or other information are obtained in connection with these testing sites, atomic explosions, that information is screened or is approved by the Atomic Energy Commission for release and insofar as it is concerned, let us say, with the design of weapons that information would be withheld even if it contained information of importance to, let us say, the Public Health Service.

I wanted to ask Dr. Scheele whether he has any information on this score, whether there is a problem.

Dr. SCHEELE. This has not been withheld from us. Of course, the Public Health Service isn't per se concerned with the construction of a weapon.

What we are concerned with are the effects of weapons.

Mr. ROBACK. We appreciate that. But a lot of important information about radioactivity is contained in documents which contain information relative to weapon design. In that sense the AEC would withhold the information because there is that connection. The Public Health Service would not be in a position to screen out the information of possible importance to them. At least that has been represented to us.

Mr. HOLIFIELD. You understand the point that is being made.

Dr. SCHEELE. Yes, sir.

Mr. HOLIFIELD. If there are documents that are classified that may have information in the field in which you are concerned with and weapons information and by virtue of the fact that it has classified weapons information, the whole document is withheld from you.

Dr. SCHEELE. I don't think that is necessarily the case. I might ask Dr. Howard Andrews who has worked intimately with AEC. There have been times when we wondered whether he has been working for them or for us.

Mr. HOLIFIELD. May I put a direct question to him?

Dr. SCHEELE. Yes.

Mr. HOLIFIELD. Dr. Andrews, are you "Q" cleared for access to classified documents?

Dr. ANDREWS. Yes, I am.

Mr. HOLIFIELD. Has there been any reluctance on the part of the AEC in making available to you documents for scrutiny which might have weapon information?

Dr. ANDREWS. In no instance has this happened. I have had access to everything I have needed or have ever asked for and this includes rather highly classified weapons information.

Mr. HOLIFIELD. You do know what to ask for in the way of documents. I am speaking of this seriously. Because there might be documents in existence which you are not aware of.

Dr. ANDREWS. This could be. I have been very careful of course to ask only for documents that I definitely need.

Mr. HOLIFIELD. Have you worked closely with Dr. Shields Warren and other men in the medical department?

Dr. ANDREWS. Yes, I have. I have been a member of several committees with him.

Dr. SCHEELE. I don't believe this is a problem.

Mr. HOLIFIELD. We are glad to hear that.

Dr. SCHEELE. In fact Dr. Andrews on his assignment with AEC and AFSWP has been responsible for actual segments of the testing program as a principal on their behalf and as such has been in on their planning and evaluation conferences.

In addition, some of our staff members served as members of a variety of committees which exist that are concerned with some of these broad problems across the board in defense.

To our knowledge there has not been anything that they have ever withheld from us.

Mr. HOLIFIELD. The committee is reassured on that point. The line of questioning was as a result of testimony that we had from Dr. Taylor of the Bureau of Standards in which he expressed the belief that there might have been classified documents withheld from their radiation protection research because it contained classified weapons information, which was in those documents, and on a need-to-know basis they were withheld.

Dr. SCHEELE. I feel quite sure that in the health field, the biologic effects field, information has been made very freely available. I would suspect that most information is actually public information today. I think the policy of the AEC in the health field has been to release information. This doesn't mean that as they first obtain research information from a particular contractor, from Argonne Laboratory or one of the others, that it isn't held for the moment before it is released.

I think our problems are not with withholding of information. Our problem, if we have any, is the frontier that science has come up to. Our problems are the things that nobody knows, the undone experiments that will produce exact answers to what level small doses over long periods of time will produce harmful effects.

I think that is our problem. It is in doing more research and getting more information than it is having access to data available now.

Mr. BALWAN. I have a question on the difficulties in research when the material is classified. Is it a feeling of the Public Health Service that there is imposed upon research an added difficulty when material is classified?

Dr. SCHEELE. I think it is inherent, yes. There are complications when research is classified, because many people have an interest in the same broad field, then don't know the scientific facts that have been developed.

On the other hand this has not affected us in the Public Health Service because our staff have had access. We have been working with these other folks in Government agencies so that we have known everything we have needed to know.

Mr. BALWAN. Is there a restriction placed upon research and your use of that material with consumers of your information, when you are using classified information?

Dr. SCHEELE. This is not a volume problem in our case. We haven't had to face that situation. It is a rather rare instance when something that has been done in the Public Health Service has actually had to be classified.

Our own work is very much in the clear. I just don't believe this has been a major problem as far as we are concerned. I know that psychologically one worries about what the other fellow might have in a filing case, and I know that many people outside assume that information in the radiobiology field exists that they are not getting but I suspect they know about everything that everybody else knows.

Mr. BALWAN. Thank you, Doctor.

Mr. HOLIFIELD. Mr. Morgan has a question.

Mr. MORGAN. Dr. Scheele, these studies that have been performed by PHS for AEC and the Department of Defense or other governmental agencies or departments you say is available to FCDA or other agencies interested in it.

Is this availability on a request basis or is it voluntarily distributed?

Dr. SCHEELE. I can't speak for FCDA. In our case it is essentially on a request basis unless we are working on a particular project in which case the information flows automatically.

I might point out the kind of relationships we have in one instance. We work very closely with the Chemical Corps of the Army because of delegation. And we have—there is on my staff a Chemical Corps officer, Colonel Guild, who is here this morning, who is on loan to the Public Health Service from the Army.

We reimburse the Army for his pay. He is the bridge between Chemical Corps and the Public Health Service. I don't think there is anything left to be desired in this field. We had an interest in these problems long before FCDA came into existence. We had established working relations. The extent to which one knows or doesn't know information in many instances depends on people and personalities and

sometimes on whether or not one walks across the street and expresses the interest.

Mr. HOLIFIELD. You spoke in regard to the Defense Department. How about the liaison and the flow of information between you and FCDA?

Dr. SCHEELE. This is as perfect as any flow of information can be.

Mr. HOLIFIELD. Because of the assignment of Public Health Service to FCDA?

Dr. SCHEELE. I would like to think it is for reasons beyond that. There is no exact answer. I would like to think that the folks topside and all along the line in FCDA see the Public Health Service as a resource to them in the conduct of their program and therefore through their health staff work with us very intimately.

Dr. Whitney is in our offices very frequently. Our staff go to Battle Creek frequently. We participate in their staff meetings.

Because of the extent of our emergency activities in the Public Health Service many years ago, we set up an Office of Health Emergency Planning. Dr. John B. Hozier, who is on my right this morning, is in charge of that Office. This is an important function. We actually have full-time personnel on my immediate staff dealing with our operating units in the Public Health Service and maintaining liaison with outside Government agencies. In general, we have no problem on exchange of information.

Mr. MORGAN. How does FCDA become aware of these projects that you are doing for AEC or the Department of Defense. Is the information to be made available on a request basis? If they are not aware of it they wouldn't request it.

Dr. SCHEELE. Again I think this comes from the intimacy of the working relationship of our people. Dr. Williams knows we are interested in problems of streams and contamination of streams by radioactive waste. Because of that and because of his contacts with the very same people in the AEC with whom we are dealing, he is aware of the fact that we are doing something.

With all the things going on he is not interested in all the details of experiments until they are final as a result. But I would suspect that he has no problem knowing about these things. There are conferences. There are discussions of these needs. Most of these things that are worked on are not very mysterious. Every good engineer in a State in the field of water pollution or local health department, who is worth his salt, is well aware of the kinds of problems that exist. I think, generally speaking, the fact that research of various types is going on is pretty generally known.

Mr. HOLIFIELD. All right, let's get on with the prepared statement.

Dr. SCHEELE. I might add one additional thing if I may. Dr. Dearing has just reminded me that we were proposing to do some projects on radiation monitoring under the other public health hazards provision of the delegation and it was planned to have some projects of that sort included in our fiscal 1956 budget.

The reduction made by Congress in 1955 on our request caused these projects not to be undertaken.

Mr. HOLIFIELD. Let's have some additional information on that. How much did you request to do the complete job of delegation to the Public Health Service?

Dr. SCHEELE. Our totals for Public Health Service in the 1956 request were $1,406,000. There was appropriated $806,700.

Mr. MORGAN. Was this your initial request or was this the amount that was approved by the Bureau of the Budget?

Dr. SCHEELE. The $1,406,000 was the amount approved by the Bureau of the Budget. Our original request was $1,600,000.

Mr. HOLIFIELD. Was that made on a careful analysis of the need that you would have to carry out this program.

Dr. SCHEELE. Yes, sir, it was. It was made on the basis of an analysis, a joint analysis by the staff of FCDA and ourselves.

Mr. HOLIFIELD. And in your opinion a request of $1,600,000 would have given you an adequate appropriation to carry out several matters under the delegated authority?

Dr. SCHEELE. Yes, sir. Within the limits of our ability to tool up so to speak and get staff and get projects underway.

It was not ideal from the standpoint of all the things that need to be done. In our budget for 1957, as we were developing it, we saw the possibilities of doing more as time passed. Such expansion is a normal sort of thing.

Mr. HOLIFIELD. You received $806.700 which was approximately half of your original request and a little more than half of the budget approval?

Dr. SCHEELE. That is correct.

Mr. HOLIFIELD. Has this been spent?

Dr. SCHEELE. It has not all been spent.

Mr. HOLIFIELD. You have a quarter of a year to go, have you?

Dr. SCHEELE. Yes, sir.

Mr. HOLIFIELD. How has that fulfilled your responsibility under your delegation? Do you feel that you have fulfilled your delegated responsibilities?

Dr. SCHEELE. No, sir, I don't believe that it has. Even a budget of $1,406,000 would be a very minimal budget. With the reduced budget we have not been able to fulfill even our initial obligations in the field of chemical defense.

Mr. HOLIFIELD. I see. So if you have not been able to fulfill it in the field of chemical defense, that leaves you how many other delegated areas, roughly 7, in which you have had to minimize?

Dr. SCHEELE. That is correct. We scaled down based on priorities within the total program.

Mr. HOLIFIELD. Then you have not done very much in the way of assistance, have you? If you have had to cut down to that extent?

Dr. SCHEELE. Not as much, Mr. Chairman, as we think we should have been doing and as we would have liked to have been doing. Because of these cuts we have kept major emphasis on training and the dissemination of information through training programs using materials already available.

Mr. HOLIFIELD. When you made your request of $1.6 million, was that sum arrived at after consultation with the FCDA?

Dr. SCHEELE. Yes, sir, it was.

Mr. HOLIFIELD. And the budget did approve $1.6 million on that?

Dr. SCHEELE. $1,406,000.

Mr. HOLIFIELD. Congress gave you $806,700 or was that a reduction as a result of the FCDA as a result of a reduction in their overall budget?

Dr. SCHEELE. Dr. Dearing, can you help me on that?

Dr. DEARING. I am Dr. W. Palmer Dearing, Deputy Surgeon General of the Public Health Service.

Mr. HOLIFIELD. You refer to my remarks that the $806,700 was the determined allocation of FCDA.

Dr. DEARING. Yes, sir, on the basis of the total appropriation. The appropriation was a lump-sum appropriation to FCDA which then had to allocate it among the delegated agencies. They made an allocation to the Department of which the eight-hundred-odd thousand was allotted to the Public Health Service.

Mr. HOLIFIELD. In the preparation of this item in your budget did you present this in your regular budget, Dr. Scheele, or was this amount one of the earmarked items in the overall FCDA budget and therefore presented by them to the Appropriations Committee.

Dr. SCHEELE. This item for fiscal 1956 was in the FCDA budget and was presented by them with our staff standing by to answer technical questions. In 1955 the question, or the request was in the Public Health Service budget and we defended it directly.

Mr. HOLIFIELD. When was this?

Dr. SCHEELE. In 1955.

Mr. HOLIFIELD. The previous budget?

Dr. SCHEELE. Yes, sir.

Mr. HOLIFIELD. How much was that request?

Dr. SCHEELE. $1,248,100, and the Congress appropriated $576,200.

Mr. HOLIFIELD. So you came out about the same in those instances as far as receiving what you asked for? In fact you came out a little better with the FCDA's proposition than you did with your own apparently.

Dr. SCHEELE. Percentagewise, yes, sir.

Mr. HOLIFIELD. In the presentation of this budget to the Appropriations Committee, was there time given by the Appropriations Committee for an adequate presentation of the program involved in this budgetary request?

Dr. SCHEELE. I can't speak for 1956, because I was not personally present. I can speak for 1955.

Yes, sir, they permitted us time for a fairly extensive presentation. I say that based on my own experience with congressional appropriations committees.

Mr. HOLIFIELD. Sometimes I know the smaller items in a budget do not get time for adequate explanation. Now let us proceed to the 1957 budget. What has been your request there?

Dr. SCHEELE. The FCDA request before Congress includes $2,590,000 for Public Health Service activities for fiscal 1957.

Mr. HOLIFIELD. What was your estimate of your need for the 1957?

Dr. SCHEELE. We started with an initial request for approximately $4,400,000.

Mr. HOLIFIELD. What did the Budget Bureau approve?

Dr. SCHEELE. $2,590,000.

Mr. HOLIFIELD. We have before us a chart which I believe you are using which shows that your request was $4,447,000 and the FCDA cut that request to $3,117,000 and the Bureau of Budget apparently cut it to $2,590,000. Is that a correct sequence?

Dr. SCHEELE. Yes, that is correct.

Mr. HOLIFIELD. That has not been acted upon yet.

Dr. SCHEELE. Apparently the House has acted on this budget. I don't know the result.

Mr. HOLIFIELD. Did they approve the budget request on this item or do you know?

Dr. SCHEELE. I don't know. I don't know whether they were specific on this item in the total civil defense appropriation.

Mr. HOLIFIELD. I happen to know that answer myself I guess. That would receive another cut the same as the one before because there was a refusal by the Congress to appropriate the money that was requested by FCDA and there would apparently be another percentage cut in this budgetary approved item of $2,590,000.

Mr. MORGAN. I think that the Appropriations Committee in the House appropriated a total of $1,500,000 approximately for all of the delegations. That would include the seven other agencies involved. So that would be just a little more than half the amount that the Bureau of the Budget approved for the Public Health Service.

Dr. SCHEELE. We become involved here in a difficult philosophical question, the one you mentioned earlier. What is the normal function of Public Health Service? To what extent should these activities be just a part of our regular program, not necessarily identified as civil defense?

I think it is trying to unscramble that question that may lead to some of these reductions along the way.

Mr. ROBACK. You haven't appeared before the Appropriations Committee in behalf of this budget. The FCDA has and you stand by.

Dr. SCHEELE. That's right.

Mr. ROBACK. You don't testify and present the program directly; is that correct?

Dr. SCHEELE. That is correct.

Mr. ROBACK. You don't want to leave the inference with the committee that the FCDA can do a better job than you in presenting your own budget?

Dr. SCHEELE. In general, no, but I think the health staff of the FCDA could do just as good a job as we can. They understand these problems very thoroughly.

So I think given an opportunity, they can do it just as well as we can. I suspect that with this appropriation like many others that we defend directly in the Public Health Service in our own budget, there is always the question of how much time a committee can spend going into all the detail in the light of the total scope of the program.

Mr. ROBACK. This discussion started out with a discussion whether by virtue of delegation of authority from the FCDA you were not acquiring some extra funds.

The question now is by virtue of this delegation are you getting less funds than if you had a statutory responsibility in this field and you went up to the Congress with your budget.

Dr. SCHEELE. I don't think we can answer that question. This depends on the interest of whatever individuals we or FCDA, in one or the other case, defend the budget before.

Mr. ROBACK. Isn't it a fact if there is a low opinion appropriation-wise of civil defense effort, your effort suffers wth it?

Dr. SCHEELE. That could be correct.

Mr. ROBACK. If you are, just for the sake of the discussion, divorced from the vagaries of judgment about the civil defense effort, conceivably you might get 4 or 5 or 6 times the budget for Public Health Service particularly since radioactivity and its consequences for health has now become a built-in problem in the economy?

Dr. SCHEELE. I don't think, of course, we can know whether we would or not.

Mr. HOLIFIELD. Let's explore this factor for just a minute and see if that would be a true assumption. What did you ask for for your overall public health service before the Appropriations Committee when you appeared before the Appropriations Committee, excluding this?

Dr. SCHEELE. $385,510,000.

Mr. HOLIFIELD. What did the budget approve?

Dr. SCHEELE. That is what the budget approved.

Mr. HOLIFIELD. What did you ask for?

Dr. SCHEELE. I don't remember that figure.

Mr. HOLIFIELD. Do any of your people have it?

Dr. SCHEELE. No, sir; we don't have it here. We can furnish it to the committee very readily. It was very close to the same amount. (The amount was $395,428,000.)

Mr. HOLIFIELD. What did the Congress give you?

Dr. SCHEELE. The House gave us a reduction of approximately $10,500,000. They raised some items, they reduced others. They reduced our hospital survey and construction program $19 million. They raised our National Institutes of Health research support and training program by $10 million, making a simultaneous reduction of $1 million in our microbiological and allergy program.

Mr. HOLIFIELD. You also received consideration on the Salk vaccine request.

Dr. SCHEELE. Yes, Sir. The House allowed the full $27 million plus what we asked for to continue that program to its full completion—that is the committee did.

Mr. HOLIFIELD. You fared better with your own budgets and the justification of your own budget, percentagewise than you fared under the presentation by the FCDA. Because a reduction of 12 million from 290 million as I look at it is about 4 percent.

Dr. SCHEELE. The only experience we have had is that 1955 experience and that did not show us as able to sell the figures on what should be done. I grant it is not under the circumstances you describe. It is under the circumstance of being done as part of another agency's basic legislative authority.

Mr. HOLIFIELD. I think we should insert this chart in our records at this point in order that we might have a clear picture. Will you please identify this chart as being a correct duplicate of yours?

Dr. SCHEELE. Yes, Mr. Chairman. This chart is a description of the budget requests and appropriation for 1955 and 1956 and for the appropriations requests for fiscal 1957.

Mr. HOLIFIELD. It will be received without objection into the record.

(The document referred to is as follows:)

Civil defense activities, Public Health Service

Project	1955			1956			1957		
	Department request	Bureau of Budget request	Actual	Department request [1]	Bureau of Budget request	Appropriation [2]	Department request	FCDA request	Bureau of Budget request	Appropriation
Research and development:										
Detection, identification, and protection against biological and chemical warfare agents	$579,000	$503,000	$127,847	$183,900	$146,900	$31,800	$880,000	$382,000	$222,000	----------
Basic sanitation studies	243,000	194,000	63,633	139,100	139,100	70,600	357,000	200,000	133,000	----------
Radiation protection of vital areas	0	0	0	272,000	237,000	0	100,000	65,000	65,000	----------
Cooperation with non-Federal laboratories	----------	----------	0	----------	0	0	290,000	200,000	100,000	----------
Whole-body irradiation studies	0	0	0	----------	0	0	200,000	200,000	200,000	----------
Protection of hospital facilities, patients, and personnel	0	0	0	160,000	50,000	0	160,000	110,000	110,000	----------
Total, research and development	822,000	697,000	191,480	755,000	573,000	102,400	1,987,000	1,157,000	830,000	----------
Training:										
State and local training	309,000	247,000	126,190	395,000	365,000	254,000	740,000	430,000	380,000	----------
Recruitment and training of the commissioned reserve	228,000	183,000	125,556	228,000	228,000	232,700	1,000,000	850,000	800,000	----------
Medical Education for National Defense	0	0	0	0	0	0	80,000	80,000	80,000	----------
Total, training	537,000	430,000	251,746	623,000	593,000	486,700	1,820,000	1,360,000	1,260,000	----------
Program development and consultative services	151,000	121,000	132,974	240,000	240,000	217,600	670,000	600,000	500,000	----------
Total, Public Health Service	1,510,000	1,248,100	576,200	1,618,000	1,406,000	806,700	4,447,000	3,117,000	2,590,000	----------

[1] Does not include salary increases.
[2] Includes salary increases.

Mr. HOLIFIELD. You may proceed, Dr. Scheele.

Dr. SCHEELE. The blue dots show Public Health Service hospitals, which can be counted as assets in case of attack. These represent a total capacity of approximately 10,000 beds: Boston, New York, Baltimore, Norfolk, and so on.

These green dots show our principal research centers available for investigations in such fields as epidemiology, immunology, detection, and identification.

And these yellow dots which we referred to earlier are sectional research laboratories, not under our direct supervision but which have been furnished financial support by the Service and which can be considered available in the case of enemy attack.

To man the red, blue, and green locations, the Service comprises a total of approximately 19,000 persons, including 1,400 physicians, 300 dentists, 300 sanitary engineers, and 1,000 nurses.

Mr. LIPSCOMB. Can you tell the committee how this personnel is allocated to regions?

Dr. SCHEELE. I can make a very general comment. We can give you some breakdown then of the exact locations of our staffs. The large number of our physicians, dentists, and nurse staffs are in the operation of our hospitals where we care for merchant seamen, coastguardsmen and groups of other beneficiaries. As far as regional distribution is concerned we do not have large staffs in the regional offices. We normally have 1 or 2 medical officers, 3 or 4 sanitary engineers, 1 or 2 Public Health nurses, and certain other personnel. For example, we have a venereal disease control officer. We don't have them in every one of the offices now. We have a tuberculosis control officer. Under the Hill-Burton hospital program we have various specialists and control officers who deal with the States and the regions in relation to their State plans for hospital health center construction.

Then we have a certain number of people we call Public Health representatives who are generalists who can deal with these programs.

Mr. LIPSCOMB. Are these all the people included in the 19,000 people?

Dr. SCHEELE. That is correct. This includes clerks, stenographers, National Institutes of Health, the ground forces, the total employees in the Public Health Service.

Mr. LIPSCOMB. Mr. Chairman, could we ask the Public Health Service to submit to us a breakdown of the location of these persons in the nine regions?

Mr. HOLIFIELD. We will be glad to have that, Dr. Scheele.

Dr. SCHEELE. You want the breakdown of our total personnel through the country broken by regions, not the regional staff per se. This would include that.

Mr. LIPSCOMB. Yes. I am asking that question because of a statement you are going to make next. I asked the Public Health Service to give us a breakdown of the 19,000 personnel throughout the United States, how it is allocated. In other words—may I read this next statement of yours?

Dr. SCHEELE. Yes, you may.

Mr. LIPSCOMB. He says:

This is the basic machinery which we will use to maintain or restore the health of the Nation in time of attack.

If all of this personnel is allocated on the east coast the machinery isn't functioning properly for the west coast.

Mr. HOLIFIELD. I want to compliment Mr. Lipscomb on his interest in the west coast. He and I are both from Los Angeles and I want to identify myself with his interest in this.

Dr. SCHEELE. Mr. Chairman, a number of years ago I was before a committee of the Senate for confirmation and one of the principal questions I was asked was what I was going to do if the Senate confirmed me and I took over the Public Health Service to spread some of the Public Health Service activities west.

Mr. HOLIFIELD. I think that was a pertinent inquiry.

Dr. SCHEELE. Off the record.

(Discussion off the record.)

Mr. HOLIFIELD. You may proceed.

Dr. SCHEELE. I think we clarified that, we will get that for you.

(The document referred to is as follows:)

Commissioned and civil-service personnel of the Public Health Service

	Total	Medical	Dental	Sanitary engineer	Nurse	Other
Region I: Connecticut, Maine, Massachusetts, New Hampshire, Rhode Island, Vermont	430	56	18	5	60	291
Region II: Delaware, New Jersey, New York, Pennsylvania	1,740	157	36	12	197	1,338
Region III: District of Columbia, Kentucky, Maryland, North Carolina, Virginia, West Virginia, Puerto Rico, and Virgin Islands	7,530	595	66	73	604	6,192
Region IV: Alabama, Florida, Georgia, Mississippi, South Carolina, Tennessee	1,280	93	15	32	78	1,062
Region V: Illinois, Indiana, Michigan, Ohio, Wisconsin	920	69	19	59	71	702
Region VI: Iowa, Kansas, Minnesota, Missouri, Nebraska, North Dakota, South Dakota	670	80	17	11	121	441
Region VII: Arkansas, Louisiana, New Mexico, Oklahoma, Texas	2,460	177	32	11	361	1,879
Region VIII: Colorado, Idaho, Montana, Utah, Wyoming	430	36	11	12	49	322
Region IX: Arizona, California, Nevada, Oregon, Washington, Alaska, Hawaii	3,540	260	68	34	613	2,565
Total	19,000	1,523	282	249	2,154	14,792

Dr. SCHEELE. Any part or all of this organization is capable of immediate transfer to war requirements. Both FCDA and the Public Health Service have as a common mission the welfare of the American citizen, but the overall programs, although complementary, are separate.

For example, the medical casualty care program, including the stockpiling of medical supplies needed for casualty care, has been retained as a direct civil defense function by FCDA.

Mr. HOLIFIELD. Going back to the 19,000 persons you list 1,400 physicians, 300 dentists, 300 sanitary engineers and 1,000 nurses. That is far from the total of 18,000. What is the nature of the balance of that personnel?

D. SCHEELE. The balance of the personnel would be in hospitals, where for example, they would be the laboratory technicians, the orderlies, the people who work in the kitchens, the people who work in the laundries, the people who work in the heating plant. In our

research activities they would be the technicians again and clerks and stenographers, ground force, the nonprofessionals so to speak, who are a part of the total program.

Mr. HOLIFIELD. Let me ask you this question. I know there is a certain amount of competition and antagonism on the part of private doctors and the public health service. Is there any kind of coordinated medical organization at this time of these private health people and the public health people which could operate in case of enemy attack on a coordinated basis. Will you please explain that?

Dr. SCHEELE. I think we have the basic structure for that. The FCDA has a medical advisory committee to Governor Peterson and important on that committee among others are representatives of medical and nursing professions outside. The American Medical Association maintains a special operation with fulltime staff and committee in these areas of emergency medical service.

From time to time they undertake studies. I think the cooperation between them and FCDA and ourselves has been very good in the civil defense area. Then we have counterparts of the same type operation in the States. The State civil defense health chiefs, use because they are the resource of the State or the community in the event of the attack, the private practicing physicians, the nurses and the volunteer workers.

They have the same kind of committees and intimate working relationships with their medical and nursing people who are in private practice in the States and our State medical societies all have special committees which devote time and interest to the problems of civil defense.

So I think we have a very intimate working relationship as between government at all echelons, all levels and with the people who are outside and in the voluntary health area.

Mr. LIPSCOMB. Is what you are discussing with regard to this subject actually in practice now or is it theory? Have there been plans worked out in the FCDA concerning doctors and nurses to coincide with your program?

Dr. SCHEELE. We are their arm in these delegated areas.

Mr. LIPSCOMB. That is understood. But are there any plans down on paper, or any arrangements that are in existence today, that have been made in case of an enemy attack?

Dr. SCHEELE. We have emergency operating programs and their staff and our staff know our resources and understand our working arrangements. Their regional offices would call on us for the support they need.

Mr. HOLIFIELD. Let's get right down to the basic facts that Mr. Lipscomb is trying to find out. In case of an attack upon the city of Los Angeles, let us say, who would take over these functions? Who would be the directing head? Would you as the arm of the Federal civilian defense, would your man in that area take over and coordinate and direct medical services and casualty, mass casualty treatments or would there be an uncoordinated attempt at all the different local levels?

Dr. SCHEELE. No, sir; it would be a coordinated effort. If it worked as it is planned, the organization immediately responsible would be either the Los Angeles City or County—I suspect in this

case it would be the county—medical civil defense person and he in turn would function through the State health department which is the health civil defense structure, Dr. Merill in San Francisco. Merill's relationship would be with the regional office of the FCDA and the staff there.

Mr. HOLIFIELD. Would you not be in charge, or would you be there to aid in a consultative capacity?

Dr. SCHEELE. The latter is correct.

Mr. HOLIFIELD. As far as the relief to the civilian population is concerned that would be under your State and county setup?

Dr. SCHEELE. That is right. If, for example, there was a question about contamination of a water supply and they wanted additional help in determining what the contamination was a request might come into our San Francisco office through these channels for help from us.

If our San Francisco regional office has the manpower or if we have in our reserve officer program the manpower, or there were available in the general area someone who was not needed because of a local attack in his home area, that person could be mobilized as a resource to the State and sent down to Los Angeles to help in that situation.

Through the communication network back to Washington to the Public Health Service—certainly we would be functioning in a relocation center—there is an opportunity to mobilize resources from here beyond the regional area based upon our intelligence at any given moment of what is happening nationally and potentials for need overall. We could mobilize staff from any part of the country, trying to do it as efficiently as we could to go out and help in that situation.

So I think there is a very workable mechanism which is well-established for these things to go on an orderly and coordinated basis, provided certain other things permit us to operate that way. I am thinking now about communications, transportation, which are rather complicated and difficult problems.

It will not do much good in giving Los Angeles support if Los Angeles has no way of getting in touch with the world outside, to get the word out on its needs under those circumstances.

Those are problems of great concern to us but not problems in our direct operation.

Mr. HOLIFIELD. This committee can understand then that from an operational standpoint in time of emergency, the basic responsibility lies upon the State and the county medical associations and hospitals and facilities to discharge the responsibility of taking care of the people in case of enemy attack.

Your work will have been done on the basis of research and making available to them information from your store of information and of course you will be available on a consultative basis and such facilities as you do have will be available, but the major portion of the job must at this time be done by the local facility.

Dr. SCHEELE. That is correct.

Mr. HOLIFIELD. Local personnel.

Dr. SCHEELE. I might add just one thing to your statement, Mr. Chairman. The responsibility would be on officials in the city or county, using the volunteer people and programs. In other words,

there is a person with official status who would have this. Our responsibility, as you pointed out, is one of having helped them earlier, having helped them to improve their readiness. It is our additional responsibility beyond that to give them actual resources if in fact they need those resources and we have them available.

One of the purposes of our inactive reserve program which has been set up under the FCDA delegation has been to get ready in advance people who would be willing to be mobilized to be sent to States and local areas to work for them, not necessarily for us. This pattern we follow is a standard pattern in the Public Health Service. Under the law we are permitted to loan personnel to health agencies. We loan them through the States also. This is our normal point of contact for example, in some of the national disasters that have occurred in some of the recent floods. We have on request assigned substantial numbers of staff to the State health officers who in turn have assigned them to local communities to work.

Mr. HOLIFIELD. When you speak of this reserve, you are speaking in terms of a few hundred people that are on your list on a call basis are you not?

Dr. SCHEELE. That is essentially correct. About 1,400 people.

Mr. HOLIFIELD. About 1,400 people that are on your lists that are available for call for reserve duties?

Dr. SCHEELE. That is correct.

Mr. HOLIFIELD. In the last sentence here of this paragraph you have just finished:

For example, the medical casualty care program, including the stockpiling of medical supplies needed for casualty care, has been retained as a direct civil defense function by FCDA.

That refers to their stockpiling of medical supplies and equipment, does it not?

Dr. SCHEELE. Yes, sir, and also to the care of casualties, the emergency medical services.

Mr. HOLIFIELD. So such arrangements as have been made in this field must have been made directly by the FCDA with local groups such as we have described, rather than with your department.

Dr. SCHEELE. That is correct. Except as we have been an extra hand to them in helping them to develop manuals on hospital functions under attack and things of that sort.

Mr. LIPSCOMB. From your testimony, do I gather that the Public Health Service is more in an advisory capacity to the State and local civilian defense agencies.

Dr. SCHEELE. That is correct.

Mr. LIPSCOMB. What does this mean in your statement that these 18,000 employees are the basic machinery that you will use to maintain or restore the health of the Nation in time of attack?

Dr. SCHEELE. Insofar as we play any role, whether it be technical consultation, whether it be in some instances functioning directly, various things that can happen in the circumstance of attack, these are our resources. It can be that the Governor of California or any State could take over the operation in his State because of civil defense emergency instead of independent county-city activity. Also, under the Civil Defense Act, the President could have the Adminis-

trator of the FCDA take over direct operations of programs under the circumstance of a major attack.

The Public Health Service as it stands today has this as our resource, and we would be helpful in those circumstances where we can be. If we had to do a lab determination, these are the lab people, the lab resources.

If it is a matter of—we point out a little later or did point out earlier and mention again—our hospital in Bethesda, the Clinical Center, if Washington were attacked, and if it were left standing and functioning would become a greater Washington area resource to help in the local situation.

Our hospital in San Francisco would be a local resource and function under the local civil-defense authority. That is what we mean by our resources. Maybe our words are poorly chosen. We did not mean to imply that somehow or other this staff was going to mend the wounds and treat the burns of all the thousands upon thousands of people who conceivably might be injured nor that we would do all the monitoring or do all the detection of chemical or biological agents. What we meant was that this is the resource that we have.

Mr. HOLIFIELD. This is the resource and this is available.

Dr. SCHEELE. That is right.

Mr. LIPSCOMB. Then you would recognize that you would need much augmentation in personnel and facilities. Have you ever made a survey of the amount of such augmentation that will be necessary in case of an enemy attack? How much augmentation would you need in your agency for this purpose?

Dr. SCHEELE. No, I don't think we have that as an exact thing.

We would call on a considerable number of these reserve officers. They are a reserve for use in our own direct operation in support of FCDA and their programs and they are also available to use on loan into areas where they need additional help. I might say that essentially the people we are developing in our reserve would not be intended to give clinical care; that has to be organized on another basis, locally.

Our people would be people largely functioning at administrative level in helping to direct and organize and operate the actual specific programs of direct care and public health.

Mr. LIPSCOMB. Did the Public Health Service participate in Operation Alert in 1956?

Dr. SCHEELE. Yes, they did.

Mr. LIPSCOMB. Taking the assumptions in Operation Alert in 1956 did you find need for additional personnel that you may require?

Dr. SCHEELE. As that exercise unfolded, we had enough resources to give the support that was demanded. Whether the demands were realistic in terms of potential true life situations is another question. But we were able to furnish on paper at least the personnel that was requested to support them.

Mr. HOLIFIELD. You were able to furnish the personnel to take care of several million people.

Dr. SCHEELE. No. Not as casualties but in terms of expert personnel problems on water, food and sanitation and in situations of evacuation and things of that sort.

Mr. HOLIFIELD. We will get to those projects a little bit later. If you will bear with me a minute, I would like to go back to the previous page there where you say that your public service hospitals represent a capacity of approximately 10,000 beds.

Can you give us at this time an estimate of how many of those beds are occupied during normal peacetime conditions?

Dr. SCHEELE. I would say on the average of 80 to 85 percent; 85 percent would be a good average. We would immediately empty many of those beds by discharging patients, who in the peacetime situation deserve hopsital care but who could obtain that care outside during their final convalescence or intermediate convalescence.

Then we would do what every hospital in the country would have to do that was caring for casualties.

We would forget about our present concept of how much space one needs for a patient or per bed, and we would crowd rooms and crowd halls and crowd all kinds of facilities, so that all these resources could operate at their maximum capacity.

Mr. HOLIFIELD. If you had all of these beds in one major urban center and they were all unoccupied it would still be insufficient to take care of the casualties.

Dr. SCHEELE. This is a very insignificant support of the local area if there should be a massive attack. In some instances, if the enemy were successful in dropping his bombs where he wanted to, our hospitals might not be there as a resource.

Mr. HOLIFIELD. In other words, I think this committee can assume from the cases you have presented so far that your facilities and your personnel however well intentioned they might be, however available they might be, would be completely inadequate in the case of a nuclear attack on several of our urban centers by a first-class air power.

Completely inadequate to handle the mass of casualties that would result.

Dr. SCHEELE. Our personnel certainly would be. We did not intend to imply that with this potential of 10,000 beds in our own hospitals——

Mr. HOLIFIELD. We are not trying to put that imputation on your testimony. We are just trying to clarify the record so we can consider what you have in relation to what the need might be.

Any further questions?

Mr. LIPSCOMB. One further point on this paragraph on page 3. You mentioned that the program of FCDA and your program are complementary to each other but are separate. What is the coordination that you have between the two programs? Do you have any written program of coordination or any working agreement?

Dr. SCHEELE. We don't have formal written agreements, but, by our daily contacts and by our having an Office of Health Emergency Planning and our intimate relationship with the folks in Battle Creek and by the working contacts between our regional staff and the regional staff of FCDA, we think we have an effective program of working together.

Mr. HOLIFIELD. If we had a surprise enemy attack right away are you ready and have enough understanding with FCDA to go right to work?

Dr. SCHEELE. Yes, sir, I think so. Without question, yes, sir.

Mr. HOLIFIELD. But that is just a verbal understanding at the present time?

Dr. SCHEELE. It is more than a verbal understanding. It flows from the fact that I, as Surgeon General of the Public Health Service, and my staff believe that we have to have a civil-defense program, and a good one. There would be no holding back on the part of the Public Health Service in doing everything we can to help if we were attacked. And on the other side, over in FCDA, their staff sees the Public Health Service as an asset that the country has to help within the limits of its capacity if we should be attacked.

I don't think concepts of written agreement mean a great deal here in terms of enhancing our real opportunities to serve in a civil-defense emergency.

I think that that exists. I think it exists in the will of all of these people to have a good program, and to make it work. I don't think we would get into jurisdictional problems. This to me is inconceivable. We in the Public Health Service are accustomed to helping others, whether they be other Federal agencies or State or local groups, whether they be schools or educational institutions. We have a pattern for cooperation which makes us think we function very well.

Our relationship with the American Medical Association and the physicians outside is a very good one. There are times when we have had an item or two in our legislative program that we have not all seen eye to eye on, but beyond that there has never been a question about the support we would have from organized medicine and the doctors in the country, in this area of civil defense certainly.

Mr. HOLIFIELD. Would you say that all of your Public Health Service hospitals would be vitally needed in case of an enemy attack?

Dr. SCHEELE. Well, they would be to the extent that they are in the target areas, and, without exception, they are in target areas.

Mr. HOLIFIELD. They are, I can assure you of that.

Dr. SCHEELE. We do have some other hospitals. These within certain limits if the attack were devastating enough—all of them are fairly remote—could of course be end of the line service for patients who came out of the attack areas. We have beds in Indian hospitals. These amount to 3,815 beds. They are mostly in rural and remote areas. In that program too, as with every hospital in the United States, we would have to see how it could fit into the absorption of a mass of new patients suddenly created.

Mr. HOLIFIELD. In view of the problem of taking care of mass casualties, would you say that additional hospital casualties are needed in the United States?

Dr. SCHEELE. Yes, additional facilities are needed. They are needed just to carry on good hospital care in peacetime. We have far fewer beds and adequate beds than we need. In fact we are barely keeping pace with the growth in our population—if we are doing that. As far as the civil defense emergency is concerned, we would need large numbers of additional hospitals, but we might not be justified in building permanent structures.

I think the program of the Federal Civil Defense Administration to develop a portable mobile hospital unit has been a very excellent one. We have cooperated with them in the development of those units.

Mr. HOLIFIELD. That is the 200-bed mobile hospital groups.

Dr. SCHEELE. Yes, sir. Beyond that we would obviously have to make hospitals out of school buildings, out of other buildings as necessary to be able to deal with the problem.

I don't think we could ever develop a permanent stand-by hospital structure and support it. Certainly we could not do it on a scale that would give us the kind of support in terms of hospital beds we need in standard hospital space for the kind of mass casualties that we could anticipate if we were attacked in many different places.

They would have to be outside target areas for one thing. It is very difficult to make good hospitals function successfully off at the rural periphery or even suburban periphery of our major cities. The matter of physicians getting to see their patients is a problem. That is the normal peacetime situation. It doesn't seem that it would be feasible to ring target areas with permanent hospitals in the outlying sections on a standby basis.

Mr. HOLIFIELD. This committee visited a former defense hospital at Utica near Syracuse some year or two ago on a different project, and the suggestion was made at that time this hospital be retained for emergency hospital use.

However, I know that it has been liquidated. I am speaking of Rhodes Hospital. I think it was an Army hospital in Utica, N. Y. That has been liquidated.

Would you say it would be wise to hold some of these Army hospitals not in operation in a standby condition—Army, Navy and Air Force hospitals for a possible emergency?

Dr. SCHEELE. In general, I would say "No."

Mr. HOLIFIELD. And veterans' hospitals?

Dr. SCHEELE. In general, I would say "No." On the other hand, each situation would need to be looked at individually. I think the needs of the country at this very moment, without reference to the civil defense emergency, for hospital beds is such that rather than have a hospital set aside on a standby basis for civil defense emergency, it would be better to let the hospital go into some civilian use, preferably as a hospital, because it would then still be there as a resource if and when something happened.

For example, we have closed some of our hospitals in recent years. New York State has taken over our former hospital in Buffalo. A hospital which was closed in Cleveland is in process of being taken over as surplus property by the State mental health authority of Ohio.

Mr. HOLIFIELD. But those facilities do not go out of existence.

Dr. SCHEELE. No.

Mr. HOLIFIELD. They remain in existence?

Dr. SCHEELE. They are both being used as hospitals and ambulatory health centers and they are in existence for this use. Actually most hospital buildings except possibly some of the hotels that were converted by the Army or Navy during the war would not be very useful for any other use except some health purpose.

So I think we should think twice before we destroy any of them. I think if they are surplus property, utilized for some medical health need that a community or a State has, that we will still have the advantage of having them later and we will be serving the American public best.

Mr. HOLIFIELD. You are aware of the recommendations of the Hoover Commission in regard to the Public Health Service hospitals that they recommended that they should be liquidated.

Dr. SCHEELE. Yes, sir.

Mr. HOLIFIELD. Are you in favor of that program?

Dr. SCHEELE. No, sir. Our position at the moment is that as long as this responsibility is on the statute books and so long as the Congress gives us funds to take care of the merchant seamen, we propose to continue to operate them.

Mr. LIPSCOMB. Would you have any idea how much a 200-bed hospital would cost roughly?

Dr. SCHEELE. You mean a stationary full-blown hospital as against one of these mobile units that FCDA has?

Mr. LIPSCOMB. I didn't mean to imply that but I was leading up to that.

Dr. SCHEELE. I'm sorry to say I can't give you an exact figure. It costs $18 or $20 thousand per bed to build a standard hospital today, probably $20 thousand is a pretty good average figure. So that would be roughly $4 million.

Mr. LIPSCOMB. For a 200-bed hospital?

Dr. SCHEELE. I would like to correct that in the record getting some information from some of our hospital people if I may. I think in round numbers that is correct.

Mr. LIPSCOMB. Are you being consulted in any way as to the placement of these 200-bed emergency portable hospital units?

Dr. SCHEELE. I don't know the answer to that. I have not been personally. I am told that the FCDA health staff and our staff have discussed the deployment of them.

Mr. LIPSCOMB. And if a State purchases a quantity of these, say 20, you are in the same fashion consulted as to where these are placed, whether they be out of target areas, to be made available, easily transported in and near a target area?

Dr. SCHEELE. I don't think we have been consulted on that and I don't see any major reason why we should be. I think the FCDA and the State in that case can work that out perfectly well.

Mr. LIPSCOMB. Suppose you found that one of your Public Health Service hospitals were in a target area and were devastated and you needed some emergency facilities to continue your operations, would you be interested in a 200 bed emergency hospital?

Dr. SCHEELE. I think that actually, if one of our hospitals were devastated, our normal beneficiaries would have to fit not into an operation we would take over and try to run directly, but rather into the pool of all care of all people no matter whose beneficiaries they were.

Mr. LIPSCOMB. Do you have an interest in one of these hospitals being stored in a location so that it could be moved in so you could operate it in place of your hospital that would be devastated?

Dr. SCHEELE. No, sir, I don't believe we have any such plans. I think the devastation, if we had an attack on an area where we had a hospital and we were in a target area, the devastation and the need for medical service is so great for the community as a whole that we would not in that circumstance try to operate one for ourselves.

Whatever we have in the way of staff remaining there, would stay and would merge into the resources of the area.

Mr. LIPSCOMB. Isn't a 200-bed emergency hospital supposed to be an emergency resource to the area?

Dr. SCHEELE. Yes. I am interpreting your question as meaning would we ourselves want to have some of these set aside so if, for example, our San Francisco hospital were knocked out, we could set it up west or south of San Francisco and then would try—let's say there were people who turned up who were seamen who were entitled to care by us, we would try to funnel those people down to the hospital that we set up. I think things would be so scrambled up after an attack in terms of which patients went where, that it would be better to let the remaining city and county authorities go ahead and ring the city with some of these hospitals and a seaman or a Public Health Service officer or dependent who had been hurt would flow out into the regular casualty flow system of the moment. I don't think we could try to maintain a separate identity in terms of giving care ourselves to our screened people.

Mr. LIPSCOMB. I didn't mean that.

But have you given any thought then as to what you will do about your services in case of an emergency or enemy attack?

Dr. SCHEELE. You mean with the hospital destroyed?

Mr. LIPSCOMB. Yes. Have you made any civil-defense preparations within your own agency?

Dr. SCHEELE. Yes, we have. We intended to give to the committee a very brief outline of one of our disaster plans in our Detroit Hospital and here are some of the plans—this is Detroit Hospital disaster plan. This is our National Institutes of Health disaster plan for the operation of that hospital. This is our Lexington, Ky., hospital which is probably a little less likely to be hit and which would be a resource for Louisville and would be an evacuation point for patients from some places in Indiana.

We have also elaborate working plans in each of our facilities. If the facility is destroyed and there is chaos in the area, it is every man for himself, and whatever success the area can have in developing a resource is what these people have to flow into.

Mr. HOLIFIELD. And most of your facilities are located in big urban population centers, the centers of target areas.

Dr. SCHEELE. Yes, sir.

Mr. HOLIFIELD. Mr. Morgan has a question here on the delegation No. 6. Will you please refer to that?

Mr. MORGAN. This is the one listed in the Federal Register. This delegation was given to the Public Health Service to plan, develop, and distribute technical guidance concerning provision of shelter and other possible protective measures designed to minimize injury to personnel and reduce damage to vital functional components of hospital and other Public Health facilities.

Dr. Scheele, can you tell us if any projects have been initiated to carry out this delegation?

Dr. SCHEELE. May I pass that question to Dr. Hozier, please?

Dr. HOZIER. I would like to say that we did have plans to do this for the present fiscal year but we did not have funds to carry it on. Dr. Cronin of Hospital Construction Facilities, worked very closely with the Navy, which is considered one of the better authorities in construction and architecture of hospitals and other buildings in case of serious bomb damage and that sort of thing.

The Navy has made that sort of information available to the Public Health Service and we know whenever a Hill-Burton hospital appli-

cation is submitted to Dr. Cronin and there are sufficient local sponsor funds, whether city or State, to be matched with Federal funds, and they are willing to put so much money extra into the hospital to make it less vulnerable to damage, Dr. Cronin's staff at the Public Health Service is able to furnish them with the architectural and construction advice. On the other hand we feel that it would take about $110,000 which we have planned for 1957 to actually study how a hospital should be constructed as far as windows and doors and ventilating systems to keep out biological attack and a chemical attack by a potential enemy or radiation fallout.

Once people are admitted who have radiation in their clothing and in their skin, what would be done to protect the other people? If a patient's leg had to be amputated and the leg was radioactive, how would you dispose of that?

That sort of thing we have no competency in and it would take about $110,000 to initiate such a study.

Mr. HOLIFIELD. You are aware of the casualties that occurred at Hiroshima and Nagasaki with a 20,000 TNT equivalent power and you are aware of the pattern of 7,000 square miles of radioactivity which occurred in the 1954 thermonuclear test, are you not?

Dr. SCHEELE. Yes.

Mr. HOLIFIELD. In view of the importance of the hazard of radioactive contamination in any type of thermonuclear war in the future, you are now informing this committee that no plans have been made to take care of contaminated clothing or contaminated individuals in your hospitals. Is that what we are to understand?

Dr. SCHEELE. Well, I think what we have said is that some of the studies which would improve present knowledge on how to work or would improve knowledge in terms of future hospital construction cannot be undertaken unless the Public Health Service or someone somewhere has some additional funds and directive to do them.

Mr. HOLIFIELD. Do you recognize the importance of the need for such studies and plans?

Dr. SCHEELE. Yes sir; we think they are very much needed.

Mr. HOLIFIELD. Have you had the opportunity of setting the priority of your different projects or is that set for you by FCDA?

Dr. SCHEELE. It is set for us by ourselves. We set it in consultation with FCDA but it is also set in terms of the funds that FCDA transfers to us to work.

Mr. HOLIFIELD. Do you think this is a matter of such priority that you could suspend this particular project in preference for other projects?

Dr. SCHEELE. Yes, I think without implying that it is not an important project, in relation to other things that we are doing, it did fall to a slightly lower degree of priority.

Mr. HOLIFIELD. Could we go at this time down through your contemplated projects? Mr. Morgan, will you explore the projects which have been contemplated by the Public Health Service, projects that have been programed and the projects that have been suspended and the projects that have been put into effect?

Mr. MORGAN. Dr. Scheele, I would like to refer to your annual progress report for the year ending June 30, 1955. The first page of which appears to be a summary of the various projects initiated by the Public

Health Service and the first one designated is immunization investigations.

I understand this project was initiated in fiscal year 1955 but has been suspended. Can you tell us why this project was suspended?

Dr. SCHEELE. I can't but I can furnish that information to you. Possibility a member of my staff could tell us.

Mr. HOLIFIELD. I think it would be well at this time for Mr. Morgan to go through the list of projects, giving you our understanding, the committee's understanding of the meaning of these items and with a primary question at the end as to whether we correctly understand our interpretation of these projects and with the request that you furnish us any information that you desire as to the meaning of our interpretation.

This will save time. We are pressing for time.

Mr. MORGAN. It is mentioned in the analysis of this particular project that it was suspended during fiscal 1956 because of budget limitations. It was suspended during fiscal 1956, it was suspended as of June 30, 1955, I assume.

Dr. SCHEELE. This was on the basis of taking the "cloth" we were given in terms of money and looking at all of the things and looking at problems after 1 year of operation.

Mr. HOLIFIELD. We are not condemning or criticizing your action, we are exploring whether our understanding of this is correct.

Dr. SCHEELE. That is correct.

Mr. MORGAN. The purpose is to get into the record the projects that you have undertaken, the ones completed and the ones suspended and still active. The second one listed is the control of airborne diseases, this being in two parts. This analysis indicates that this project has also been suspended as of June 30, 1955.

The next one is rapid identification of BW agents; this is also in two parts. I notice that this is programed in your 1956 list of projects.

The next one is water supply protection. This is also still programed in 1956. The next is milk and food protection. It indicates here that this program has been suspended. The next is facilities protection standards. This project was consolidated with the water supply protection for 1956.

The next program is "Sanitary aspects of mass evacuation." This program has also been suspended according to the information here. Next program is "Plan for use of sanitary engineering personnel." It is my understanding that this program has been completed.

The next program is the "Development of training courses." This is under the broad heading of "Training." This program is still a current program during fiscal 1956. The next is "Training of epidemiologists." This program has been suspended. Next is "Recruitment and training of inactive reserve." This is apparently still very active. In 1956 under the broad heading of "Program development and consultative services," the first programing is "Civil-defense planning and program development." This is still a current project.

"Development of cooperative Federal-State program in relation to the Public Health Service aspects of civil defense." This is still listed as current in 1956. The next is "Adaptation of military CW defense to civilian needs." It indicates this has been suspended.

In summarizing this list of projects the totals are 16 projects, 7 of which have been suspended, and 2 which are overruns, which means that the funds available have been spent. And I might make a further point here, Mr. Chairman, if I may, that in 1955, fiscal 1955, the Public Health Service received a funds total of $576,200. And with these funds they initiated these 16 projects. In 1956, fiscal 1956, the Public Health Service received $806,700 with which they carried on only 7 of these 16 projects.

This appropriation for 1956 was approximately 40 percent greater than the appropriation for 1955. I wonder if we could have Dr. Scheele's comment on this analysis here and his explanation as to why we have fewer projects in 1956 than in 1955 when we had 40 percent more funds?

Dr. SCHEELE. Well, part of this was the fact that the money did not become available until later in the year; that is was not available as a matter of fact until October 1. Also these were starting projects. If one looks at the amounts of money devoted into the individual projects, you have a clear picture of the fact that in 1955 they were smaller projects. In other words, the money was spread further. In 1956, the more promising projects and those which we considered having the higher orders of priority were examined and expanded, going on a fuller scale. We have always felt that among the highest priority needs was the training area. We don't want to do only research. We need to do research but we want to develop national readiness with knowledge available at any given time. That is a very important thing.

So in 1956 our training program itself has come into not full gear necessarily, but it has come closer to full gear. This means that more of this difference in money is going into the total training area, which means proportionately few of these earlier projects are still underway.

Mr. HOLIFIELD. It does not necessarily mean that the projects originally contemplated would not be valuable if you had the funds.

Dr. SCHEELE. That's right. Had we gotten the full amounts that we were asking for we would have stepped up the training as we have done, and we would have stepped up the projects as we have done in some cases, and we would have continued projects which we have discontinued in other cases.

Mr. MORGAN. Is it your intention to ultimately continue these projects which have been suspended?

Dr. SCHEELE. If we get the money, in general, the answer to that is "Yes." There may be 1 or 2 which for one reason or another, we would drop in favor of some additional area or areas which we think, after a little initial research, would be more productive than our original plan.

Mr. MORGAN. Do you not feel that it would be important in your original training program to have the information that would result from these research and development programs?

Dr. SCHEELE. Very definitely it would be very important.

Mr. MORGAN. You place a higher priority in training with what you have now than putting it in further research that would be of value in your training program?

Dr. SCHEELE. That is correct.

Mr. HOLIFIELD. In general was Mr. Morgan's analysis of this program here accurate?

Dr. SCHEELE. Yes, sir, it was.

Mr. MORGAN. Dr. Scheele, can you tell us if you have initiated any further projects that would not be indicated on this summary list?

Dr. SCHEELE. We have not. Again I would like to carry you back to something we said very early and that is—we are doing many things in various research programs that have value to civil defense. There are many things going on in research in the normal course of events in the Public Health Service that have a civil defense bearing.

There are some positive values within the total program.

Mr. MORGAN. Am I correct in stating that of these projects listed, only one has been completed or have some of these been completed during fiscal 1956?

Dr. SCHEELE. That's right. One has been considered completed.

Mr. MORGAN. And that is the project for the plan for use for sanitary engineering personnel?

Dr. SCHEELE. Yes, that's right.

Mr. Chairman, I think we have covered most of the things that I had intended to say in the remainder of my statement.

If possible, the committee might prefer to have it, the remainder of the statement, filed for the record.

Mr. HOLIFIELD. We will insert this in the record.

(The document referred to is as follows:)

STATEMENT OF DR. LEONARD A. SCHEELE, SURGEON GENERAL, UNITED STATES PUBLIC HEALTH SERVICE

Mr. Chairman and members of the committee, I am very glad to have this opportunity to outline for you the role of the Public Health Service in civil defense. We appreciate the magnitude of the task which you have undertaken in attempting to evaluate and to improve the civil defense program for the country, and we offer you our assistance toward that goal.

The Public Health Service is the principal health agency of the Federal Government. Our basic peacetime programs are aimed at maintaining and improving the health of the American people. Under circumstances of enemy attack our responsibility does not change, but public health problems assume greater dimensions and the difficulties in accomplishing our mission are likewise increased. I need not go into details with your committee on the chaotic conditions which would follow a widespread nuclear weapon attack on this country. We must expect, in addition to the direct casualty effects of modern weapons, a serious breakdown of our modern heating, water supply, waste disposal, refrigeration and other food protection facilities. There will be dislocation and movement of large segments of the population and consequent lowering of living standards, creation of abnormal epidemic hazards, and a requirement for post-attack health service for great numbers of people.

The programs of the Public Health Service are cooperative ones. Our primary functions are technical, advisory, consultative, and supportive. We do not, for example, provide health care for all citizens. This is the responsibility of private practitioners of medicine, of local and State health departments, and of private and public hospital and medical facilities.

The Service provides scientific and technical guidance and information to operating agencies; it conducts extensive research to provide new and improved methods of countering the natural and manmade ills to which the country may be subjected, and it furnishes skilled personnel to assist in the localities which need this help.

This chart shows the Public Health Service system and its physical resources in administrative and operational facilities.

The red dots indicate the principal administrative offices.

The blue dots show Public Health Service hospitals, which can be counted as assets in case of attack. These represent a total capacity of approximately 10,000 beds.

These green dots show our principal research centers available for investigations in such fields as epidemiology, immunology, detection, and identification.

And these yellow dots are sectional research laboratories, not under our direct supervision but which have been furnished financial support by the Service and which can be considered available in the case of enemy attack.

To man the red, blue, and green locations, the Service comprises a total of approximately 18,000 persons, including 1,400 physicians, 300 dentists, 300 sanitary engineers, and 1,000 nurses.

Any part or all of this organization is capable of immediate transfer to war requirements. Both FCDA and the Public Health Service have as a common mission the welfare of the American citizen, but the overall programs, although complementary, are separate. For example, the medical casualty care program, including the stockpiling of medical supplies needed for casualty care, has been retained as a direct civil defense function by FCDA.

From this background, I would like to go into a little more detail on our basic program and our special activities under delegation from the FCDA.

Several years ago, we began our studies and planning of methods to meet the impact of enemy attack. Working with other Federal agencies, we have instituted plans for emergency relocation of headquarters offices and redirection of Service effort at all levels. We have taken into account the increase of destructive effect of the changing weapons. Studies of emergency sanitation have been made. Research in immunization has been directed toward this problem. Our hospitals have prepared emergency plans. An illustration of this activity is the program of the Detroit hospital described in the annex to this statement. A plan for continuing the essential functions of the Service in wartime is in progress and will be a continuing effort. This, of course, is a part of the overall planning by the Department of Health, Education, and Welfare, and is done with the guidance furnished by the Office of Defense Mobilization. As a final step, we will prepare instructions for each member of the Public Health Service staff for guidance under attack conditions. I'm sure that it will interest the committee to know that every person not urgently needed or physically able to reach his emergency location will be directed to give asssitance in his particular specialty to his local civil defense organization until recalled to his Service assignment.

I now come specifically to our relation with FCDA and its program. The responsibilities assigned by FCDA to the Department of Health, Education, and Welfare in FCDA Delegation No. 1 have already been stated to you. To meet this delegation, the Department reassigned areas of responsibilities to its appropriate constituents. This was done by Interim Department Order No. 8, copies of which have been furnished to the committee. You will find the responsibilities assigned to the Public Health Service on page 2 of this document.

In broad terms, our assignments lie in three general areas: (1) development of technical guidance for States, and research, from the civil defense aspect, in communicable disease, biological and chemical warfare; (2) the recruitment, organization, and training of Public Health Service reserve personnel for emergency use; and (3) the development of measures to protect and restore community health facilities.

Within the limits of appropriated funds, we have initiated programs to meet these responsibilities. The fact that budget requests have not been fully supported by appropriations has limited our progress, but with careful screening of projects, we believe we are following an orderly program of first things first. The following highlights will indicate some of the specific activities of the Service.

TECHNICAL GUIDANCE FOR STATES

This responsibility follows the well-established pattern of Federal-State relationship in health. Early in the program, we consulted the State and Territorial health officers and representatives of FCDA in each region to determine how we could best inform those individuals who had State civil defense responsibilities in the health areas named in the delegation. In most States, the health department is an arm of the State Civil Defense Agency, as recommended by FCDA. We therefore prepared a series of orientation lectures and demonstrations in such fields as emergency public health, chemical, biological, and radio-

logical warfare, particularly designed to acquaint professional health people with what they might expect and be called upon to do in the event of an attack. The material is arranged for a course of 3 days duration. Thus far, these courses have been held in 12 States, with a total attendance of 460 persons. In a number of States, the personnel who attended our courses have carried this instruction into their cities and communities. In addition to these general orientations, we conduct longer and more detailed courses at our principal research centers for specialists in various techniques necessary under emergency conditions.

RESEARCH AND DEVELOPMENT

Effective planning and training for protecting the population from new and unnatural hazards requires more scientific knowledge than is presently available. For example, prompt detection and rapid identification of toxic agents in the air, water, and on the ground is a vital need for health services, both during and after an attack. We must know the cause of disease or disability to insure proper treatment. We must also know how to remove these causes—chemical, biological, or radioactive—to permit resumption of civilian and industrial activity. Progress has been made in these areas, but continued research is needed.

PUBLIC HEALTH SERVICE RESERVE

This program involves the recruitment, training, and organization of physicians, dentists, nurses, sanitary engineers, veterinarians, and associated professional health personnel into the commissioned reserve of the Public Health Service to provide a national pool of specialists for immediate assignment to critical areas. Since October of 1954, we have commissioned an additional 1,430 individuals in the reserve. We are continually processing new applications. Recruitment is from private practice and voluntary organizations, universities, research centers, private industry, and State and municipal health agencies. The training activities for this component of the reserve corps has included four 2-week active duty training courses in special civil defense aspects of their future emergency assignment for a total of 142 officers. It has also encompassed extensive and informative training by correspondence methods (we call it our Mail Pouch) for all reserve officers now on inactive duty. From our experience, it appears that the reserve can be expanded about as rapidly as funds for training its members are appropriated.

PROTECTION AND RESTORATION OF COMMUNITY HEALTH FACILITIES

Of major importance in this field is the matter of potable water supply under conditions far more difficult than ordinarily encountered. We must be able first to determine quickly whether or not water is pure, and if not, what can be done to make it fit to drink. For these studies, we have constructed a small scale water treatment plant at our Robert A. Taft Sanitary Engineering Center in Cincinnati. Here we have investigated a number of methods of detecting the presence in water of biological agents, toxic gases, including the more deadly nerve gas, and of radioactive material. Concurrently, we are working to develop means and methods of removing or rendering harmless contaminants which may be found. We are studying new techniques in filtration, alum coagulation to remove viruses, and the use of high levels of chlorination to destroy spore-forming bacteria. In addition, as a special project, we have made a location and descriptive survey of the water systems of all larger communities in the country. The purpose of this survey was to provide FCDA with map coordinates of these facilities for use in its electronic computer for bomb damage assessment.

Due to lack of funds, in the current fiscal year we were unable to work on that part of the delegation concerning the planning, development, and distribution of technical guidance on ways to minimize injury to personnel and patients in hospitals which might result from attack by chemical, biological, or radiological agents. This phase of research would include protection of ventilating systems, disposition of contaminated tissue and other waste products, and decontamination of facilities, equipment, and personnel. For this program, we have requested $110,000 in the 1957 budget.

With regard to the program whereby the FCDA is authorized to certify to the Reconstruction Finance Corporation as to the necessity under its civil defense program of making loans to aid in financing hospitals for civil defense

purposes, the Public Health Service has furnished technical advice to FCDA on approximately 20 hospital plans submitted to us by that agency. Our comments are pertinent to the soundness of the architecture and construction features involving shelter and safety.

The conduct of our civil defense programs requires close coordination with other Federal agencies. We have, for example, detailed Public Health Service officers to staff the health offices of the FCDA since its inception. We assist and advise FCDA in a number of its own programs. We participated in the studies and planning which resulted in the 200-bed hospital now standardized as the FCDA emergency hospital. We take an active advisory role in their stockpiling program of biological items. Since the particular areas assigned us correspond to similar programs of the Department of Defense, we maintain close working arrangements with that Department. We participate in the program of medical education for national defense, conducted jointly with the armed services and FCDA. The courses presented under this program provide realistic and practical medical instruction in mass casualty care to medical school faculties. Of special significance has been our relationship with the Army Chemical Corps. We have arranged for exchange of senior staff officers and have established mutual working committees in our special fields. To provide a clear picture from the military side, orientation meetings for our top officials have been held at the Army Chemical Center, Fort Detrick, and Fort Belvoir.

There has been one change in the operation of the delegation from FCDA. Originally, the Department of Health, Education, and Welfare presented to Congress its own request for appropriations for civil defense activities. As of last year, under instructions of the House Appropriations Committee, this function was returned to FCDA, which now prepares and presents a consolidated budget for all agencies with FCDA delegations.

As I stated earlier, this has been only an outline of our activity in civil defense. I have omitted such functions as our work in connection with natural disasters such as floods and hurricanes because I understand that you are interested primarily in civil defense against enemy attack. I shall try, instead, to answer any questions you may have, with the help of the Public Health Service staff members who are here with me.

Again, thank you, gentlemen, for this opportunity to appear before you.

Mr. HOLIFIELD. We have not proceded as fast as we expected. Because of the committee's interest in this question, we have progressed slower than anticipated.

Would it be possible for you and your witnesses to appear in the morning?

Dr. SCHEELE. Yes, sir.

Mr. HOLIFIELD. I think we will have to have another hearing in order to get at the points that we need in our record.

At this time we will adjourn the meeting and if it is possible for you people to come back tomorrow morning, we will expect you tomorrow morning at 10 o'clock.

Thank you.

(Whereupon at 12:15 p. m. the hearing was adjourned, to reconvene at 10 a. m. Friday, March 23, 1956.)

CIVIL DEFENSE FOR NATIONAL SURVIVAL

FRIDAY, MARCH 23, 1956

HOUSE OF REPRESENTATIVES,
SUBCOMMITTEE ON MILITARY OPERATIONS
OF THE COMMITTEE ON GOVERNMENT OPERATIONS,
Washington, D. C.

The subcommittee met at 10 a. m., in room 1501 New House Office Building, Hon. Chet Holifield (chairman of the subcommittee) presiding.

Present: Representatives Holifield and Lipscomb.

Also present: Michael P. Balwan, staff director; Herbert Roback, director of investigations; Earl J. Morgan; James I. Eckhart, Robert J. McElroy, of the subcommittee staff; and Carey Brewer, Legislative Reference Service, Library of Congress.

Mr. HOLIFIELD. The subcommittee will be in order. We were in the midst of testimony from Dr. Scheele yesterday and we will take up where we left off, Dr. Scheele, if you remember the place and start reading there, please.

FURTHER STATEMENT OF DR. LEONARD A. SCHEELE, SURGEON GENERAL, PUBLIC HEALTH SERVICE; ACCOMPANIED BY DR. W. PALMER DEARING, DEPUTY SURGEON GENERAL; AND DR. JOHN B. HOZIER, CHIEF, HEALTH EMERGENCY PLANNING

Dr. SCHEELE. Mr. Chairman, I now come specifically to our relation with the Federal Civil Defense Administration and its program. The responsibilities assigned by FCDA to the Department of Health, Education, and Welfare in FCDA delegation No. 1 have already been stated to you.

To meet this delegation, the Department reassigned areas of responsibilities to its appropriate constituents. This was done by Interim Department Order No. 8, copies of which have been furnished to the committee. You will find the responsibilities assigned to the Public Health Service on page 2 of this document.

In broad terms, our assignments lie in three general areas:

(1) Development of technical guidance for States, and research, from the civil defense aspect, in communicable disease, biological and chemical warfare;

(2) The recruitment, organization, and training of Public Health Service reserve personnel for emergency use; and

(3) The development of measures to protect and restore community health facilities.

Within the limits of appropriated funds, we have initiated programs to meet these responsibilities. The fact that budget requests

have not been fully supported by appropriations has limited our progress, but with careful screening of projects, we believe we are following an orderly program of first things first.

The following highlights will indicate some of the specific activities of the Service.

In the field of technical guidance for States: This responsibility follows the well-established pattern of Federal-State relationship in health. Early in the program, we consulted the State and Territorial health officers and representatives of FCDA in each region to determine how we could best inform those individuals who had State civil defense responsibilities in the health areas named in the delegation.

In most States, the health department is an arm of the State civil defense agency, as recommended by FCDA.

We therefore prepared a series of orientation lectures and demonstrations in such fields as emergency public health, chemical, biological, and radiological warfare, particularly designed to acquaint professional health people with what they might expect and be called upon to do in the event of an attack. The material is arranged for a course of 3 days' duration. Thus far, these courses have been held in 12 States, with a total attendance of 460 persons.

In a number of States, the personnel who attended our courses have carried this instruction into their cities and communities. In addition to these general orientations, we conduct longer and more detailed courses at our principal research centers for specialists in various techniques necessary under emergency conditions.

Mr. HOLIFIELD. At this point may we have the names of the 12 States which have taken advantage of these courses. You may furnish them later.

Dr. SCHEELE. I believe we will have them for you. We will find them and give them to the reporter in a few moments.

Mr. HOLIFIELD. All right.

(The information referred to is as follows:)

Number of State personnel trained in general civil defense course

Georgia	34	Louisiana	35
Colorado	33	Texas	39
Virginia	31	Oklahoma	42
Maine	28	Massachusetts	30
Washington	78	Rhode Island	30
Pennsylvania	40		
Maryland	40	Total	460

Dr. STEELE. Research and development: Effective planning and training for protecting the population from new and unnatural hazards requires more scientific knowledge than is presently available. For example, prompt detection and rapid identification of toxic agents in the air, water, and on the ground is a vital need for health services, both during and after an attack.

We must know the cause of disease or disability to insure proper treatment. We must also know how to remove these causes—chemical, biological, or radioactive—to permit resumption of civilian and industrial activity. Progress has been made in these areas, but continued research is needed.

Mr. HOLIFIELD. You are speaking of progress in terms of research and development in the skills and techniques of detecting these toxic

or radioactive elements and you are not speaking of the application of those techniques to the practical result of using them.

Dr. STEELE. No, sir. In the first instance we are speaking of improving the techniques through research, ultimately of course these techniques would then be passed over to the operating people for use.

Mr. HOLIFIELD. But at this time there is no national application of these techniques to any appreciable extent for the protection of the people?

Dr. SCHEELE. Well, we had the existing techniques and to some extent we have improved them. I believe I showed you yesterday a notebook which contains an outline of a series of steps for rapid identification of infectious agents including many of the new techniques which have come from the research we have done since this project started, these are now in the hands of action agencies in the field—State and local—and other laboratory officials for actual application in the event that biological agents are suspected and might have to be determined.

Mr. HOLIFIELD. But you do not know how wide this set of information is. In other words, could you tell us that all of the towns that have water supply systems have this information?

Dr. SCHEELE. No, sir; not all of them have it. I might point out that these techniques are for skilled technicians; these are the identification techniques as against merely getting a sample to send for identification.

These techniques are exceedingly complicated in many instances and there are not a large number of labs in cities or State health departments which are set up to do the wide range of determinations. It is for that reason that the Public Health Service many years ago aided in the setting up of the intelligence centers, these yellow spots on the chart which are sectional research laboratories which can be used as reference laboratories by those who might have to identify agents.

Mr. HOLIFIELD. Those are in being at this time and would be accessible to cities in all areas for the submission of samples for detection.

Dr. SCHEELE. That is correct.

Mr. HOLIFIELD. I notice you have quite a concentration around New Orleans of laboratories. Why is it that you have 7 or 8 laboratories apparently there and none west of the Mississippi that I can see.

Dr. SCHEELE. Because this is probably a reflection on the degree to which research generally on infectious diseases has progressed in various parts of the country.

In other words some areas of the country have been highly interested in infectious diseases and elaborate facilities, mostly in medical schools, have developed.

Mr. HOLIFIELD. Are those Federal institutions?

Dr. SCHEELE. No, sir.

Mr. HOLIFIELD. They are research laboratories in hospitals.

Dr. SCHEELE. That is correct. A few of these are State laboratories. There is one in the Albany Laboratory. There are two that do not show here on this map. There is one in Lansing in the Michigan State Laboratory and in California in the State health department laboratory has a very comprehensive program, which could cope with identification of most anything that came along.

Mr. HOLIFIELD. You have no yellow dot indicating one in California.

Dr. SCHEELE. These mean laboratories to which we have given actual financial support. This is not necessarily the total national resource. I am sure, for example, that the University of California Medical School in Los Angeles and the University of Southern California Medical School, and the College of Medical Evangelists could do most of the identifications that might be necessary. In addition to that it is conceivable that one or more of the larger hospitals could do up to two-thirds of them. But where we get down to highly detailed work—let me give an example.

If one were to use biological warfare, in the ideal situation one would try to develop a strain of organism which would infect and ideally would kill. One would also try to develop a strain that the country attacked did not have a vaccine for.

In other words you would not use ordinary typhoid—for we have vaccines. We can immunize very rapidly. An enemy would want to develop another strain of typhoid which would not be protected against by our ordinary vaccine—to catch us off guard. Our job in these instances is not only to discover that it is typhoid, that is not enough. It is to find out what we will do about it after we discover it is typhoid and find out what strain this is, whether this is a variant or mutant that will require a brand new vaccine that we did not have before. This is why the tens of thousands of laboratories that exist in the hospitals to do ordinary examinations, blood counts and urines and other examinations, would not be competent to go into this work. It requires an elaborate laboratory setup to do this. That is why we have this system.

This system is working very well in the field of influenza without any relationship to the interest of the committee now. We have this lined up with Dr. Andrews in charge of the WHO center in London. We have information on strains of influenza virus that are occurring. If the Army has an outbreak among troops, let's say in London or Cairo, the reference laboratories in those areas will immediately identify the type influenza virus causing the disease. And they flash the word to all of us, and if we suddenly see a big outbreak developing in Cairo, which might develop into an epidemic of influenza such as we had in 1918 to 1919, we woudl be ready to prepare a vaccine.

But only a few laboratories are set up to do these rare and unusual tests. That is the reason for the spots as they appear in terms of concentration here. This is concentration of population although there is concentration in the Far West coast.

I think this pattern is not unlike the pattern of research in general in medicine and it may be similar in other fields, too.

We get three times as many requests for research grants from this section of the country as we get from, we will say, everything west of the Rocky Mountains.

Mr. BALWAN. I think this question should be directed to Dr. Hozier with whom we discussed the problem, the progress on research and development. How many projects did the Public Health Service have to propose when the delegation was announced or handed to you?

Dr. HOZIER. I don't know. I couldn't give you that specific number at the moment.

Mr. BALWAN. Roughly, was it 3 or 20 or 15?

Dr. HOZIER. I would say that it was probably close to around 12 to 15. Some of those were quite small and you could group them into larger groups but on a project basis it would be around 12 to 15.

Mr. BALWAN. When you received the delegation you were ready to roll with 12 to 15.

Dr. HOZIER. If we had received sufficient money. Then we had to screen these projects and take out the things that needed to be done first on a priority basis.

Mr. BALWAN. When you first received the delegation and you justified your program you had 12 or 15 projects that you were ready to roll with.

Dr. HOZIER. That's right.

Mr. BALWAN. How many of those are in progress now?

Dr. HOZIER. I would say roughly about 6 or 7. I can give you the exact figures.

Mr. BALWAN. Of those 6 or 7 since you have received the delegation how many approximately have been completed?

Dr. HOZIER. One project only has been completed.

Dr. SCHEELE. It should be pointed out that—take for example the identification of infectious agents, while we develop a scheme, let us say, to identify an agent in 8 hours instead of a normal 72 in these tests as they have been run up to now, we are not satisfied when we arrive at that point. The project goes on. We want to cut it down to 15 minutes or 5 minutes or just a look through the microscope and immediate identification operation.

So that there will be very few of these areas where one necessarily achieves an end point with which one is satisfied.

Mr. BALWAN. What is the nature of the projects which were dropped, because you couldn't get money? I presume that is why they were dropped. Would they be sufficiently descriptive by short titles in a list?

Dr. HOZIER. Yes, I think so.

Dr. SCHEELE. Mr. Chairman, Dr. Dearing, the Deputy Surgeon General.

Dr. DEARING. While Dr. Hozier is looking over this detail, I think perhaps the committee might be interested in a little perspective on the development of the research in the health field in civil defense which has been going on, the planning and the conferences and the consultations that have taken place literally since FCDA was established and before that when it was in the National Security Resources Board. We have as the Surgeon General said yesterday, furnished from the inception of the postwar civil-defense program the chief medical officer and technical staff to whatever agency was working on civil defense at the time and they have worked with us literally over the years and with our technical staff. In research and the public health application and our communicable disease control group work, on the program of research that needed emphasis in connection with the development of civil defense, we have jointly prepared budgets, with a project at one time—for example, of $800,000 of research a year on blood substitutes, which had become increasingly important. It was very important during the Korean war.

Mr. BALWAN. This was work that the Public Health Service was carrying on outside of a civil-defense category.

Dr. DEARING. Not so clearly, sir. At that time the $800,000 of funds were transferred from the Public Health Service to the Civil Defense Administration budget. There has been the closest back and forth working, and so to look at a few projects with a few hundred thousand dollars at the time that the administrative action of delegation was made is to get a very limited picture of the research that has been done and has been directed toward the civil defense and will be applicable to civil defense.

So to think of it just in terms of the projects at one time, at a given point in time and when a given budget was presented is to look at it somewhat artificially because this has been a continuing process over the years, and a great deal of work has been done and is now being done that is not supported by these specific appropriations under the delegation.

So these projects which were specifically addressed to pushing forward in certain areas that were more directly and specifically applicable to civil defense which we were not carrying on, are really a little more than a drop in the bucket. But they are not the major work that the Public Health Service is doing that is applicable to civil defense.

Mr. BALWAN. These 14 projects or so were merely a drop in the bucket compared to all the work that had to be done.

Mr. HOLIFIELD. It had been done in these fields.

Dr. DEARING. That had been done or is being done.

Mr. BALWAN. There is no intent to bring out this matter, these projects without the explanation that Dr. Dearing is making. If we can have these projects listed, I think the subcommittee's concern with you people is not as an indictment or indication that you are not getting the job done.

Dr. DEARING. I meant no inference that these projects are not significant. I wish to put these in perspective for the committee and perhaps Dr. Hozier can give them by name.

Dr. HOZIER. Yes. When you take the number of projects, you can combine them in groups which we have, five major groups. One of them was radiation studies, which we dropped entirely as a group, made up of two studies. Originally I said 14 projects. Actually the number of individual projects envisioned by us was 21 but contained within 5 groups. Since radiation has been dropped, that would be 19 now contained within 4.

Mr. BALWAN. Who was carrying on that radiation type of research, that project?

Dr. HOZIER. That is what we were going to do if we received the money, the radiation protection of vital areas.

Mr. BALWAN. Was it dropped because you found out somebody else was doing it or was it dropped at a risk, as a calculated risk. We are going to go into this and we don't know who else is doing it.

Dr. SCHEELE. If I may attempt to answer that, these were areas where we felt, and FCDA agreed with us, further development was needed; for example airplane monitoring of a community which had fallout or might have fallout. When it was decided that we would not move ahead with a major program in these fields in the Public

Health Service, when our delegation was more or less limited to exclude us from having a major role in this particular area, that did not in any way change the importance of doing this. Then it became a question of what FCDA was doing.

I can't speak for them but I would suspect that their problem was like our problem in certain other areas. Within the limits of the money they had, they would attempt to have these things done or would do them themselves.

Mr. BALWAN. Were these projects suggested by the FCDA too, or these were some you had ready that you felt should be done in civil defense?

Dr. SCHEELE. These were developed by the joint contact and discussions of the staff of FCDA and staff of Public Health Service.

Mr. BALWAN. You jointly agreed to drop this particular one on radiation?

Dr. SCHEELE. Yes.

Dr. HOZIER. The money was not there.

Mr. BALWAN. You don't know whether that particular research is being carried on now. Do you assign any degree of importance to the project now?

Dr. SCHEELE. We must remember that there are others who have interest in these same problems. The group who have been concerned with running nuclear weapons tests and other research tests are constantly concerned with monitoring problems and monitoring from the air. We must recall that in the field of biological agents the Army has the principal responsibility as far as the defense agencies go.

That is the military defense agencies' area and they are constantly in their own research program attempting to develop better methods.

Mr. BALWAN. But you, as our Nation's No. 1 public-health man, are you assured or feel confident with this project dropped by FCDA?

Dr. SCHEELE. No; we don't feel comfortable at all with these things. Many of these efforts are attempts to take knowledge which has been developed for another type of application and adapt it to civilian use in the kind of situation that we will have in civil defense. The goal is to build things which are automatic, which are well standardized, which are simple, which are not costly so that if there were to be furnishing of this equipment by the Federal civil-defense program, or if one is dependent upon State or local purchase of the equipment, it would be inexpensive, but yet so workable as to give at least the minimal answers that we need.

Mr. BALWAN. I know where we stand on this particular project that was dropped; I am not sure that the Surgeon General feels greatly concerned about it because it is not going on.

Dr. SCHEELE. We don't feel greatly concerned, for example, about further development by us of the equipment adapted to light plane use for air monitoring over cities.

Mr. BALWAN. What was the first project called?

Dr. HOZIER. Radiation studies. I think I can clarify this if you wish. Let's recall that no part of radiological defense was included in the original delegation. In February of last year Governor Peterson wrote the Department and requested that we give consideration to doing radiation studies, broken down into two areas, radiation protection of vital areas and radiation monitoring from aircraft.

We wrote back and said we would do this if funds were available and indicated that it would take $350,000 of extra money which was not forthcoming.

I think that is the answer to it. The money was not forthcoming so we did not undertake it.

Mr. HOLIFIELD. Do you know whether the FCDA made arrangements for another department of Government to do this?

Dr. HOZIER. I can only say that it is my impression that in their contract work with the University of California under Professor Keim, that this work has been included.

Dr. SCHEELE. I think the other thing that is important here is that, even as we don't know the answer to such a vital question as the cause and the ideal cure of cancer, there is also the question of how far or how fast and how much one does in research at a given time. While we would like to do a lot more, even though we have at various times suggested that we do more and ask for money to put projects into the planning stage, decisions were taken along the way that this was more than anyone wanted to support at that particular time.

There are judgmental factors as to whether anyone of these by itself or any group of 2 or 3 of them represent a great disaster if we don't do them.

Mr. HOLIFIELD. I think we better proceed along or we will be tied up today and not get to your other witnesses.

Mr. BALWAN. Mr. Chairman, could Dr. Hozier submit for the record the other projects that could not be completed?

Dr. HOZIER. Yes, sir.

(The document referred to is as follows:)

Civil Defense Projects, Fiscal Year 1956

Research and development: Designation:	*Status of project*
Immunization investigations	Suspended as of June 30, 1955.
Detection, prevention, and control of airborne diseases	Do.
Rapid identification of biological warfare agents	Continuing project.
Water supply protection and facilities protection standards	Do.
Milk and food protection	Suspended as of June 30, 1955.
Sanitary aspects of mass evacuation	Do.
Plan for use of sanitary engineering personnel	Completed June 30, 1955.
Training:	
Development of training courses	Continuing project.
Training of epidemiologists	Suspended as of June 30, 1955.
Recruitment and training of Inactive Reserve	Continuing project.
Program Development and Consultative Services:	
Civil defense planning and program development	Do.
Development of cooperative Federal-State program in relation to the public health aspects of civil defense	Do.
Adaptation of military chemical warfare defense to civilian needs	Suspended as of June 30, 1955.

Mr. BALWAN. What was the first project completed?

Dr. HOZIER. The use of the sanitary engineer officers in our regional offices in this program. A small study was done.

Mr. HOLIFIELD. You may proceed.

Dr. SCHEELE. Public Health Service Reserve. This program involves the recruitment, training, and organization of physicians, dentists, nurses, sanitary engineers, veterinarians, and associated professional health personnel into the commissioned reserve of the Public Health Service to provide a national pool of specialists for immediate assignment to critical areas.

Since October of 1954, we have commissioned an additional 1,430 individuals in the reserve.

Mr. HOLIFIELD. Can we have a breakdown furnished us of the different States in which that has been added?

Dr. SCHEELE. We can do that.

(The document referred to is as follows:)

COMMISSIONED RESERVE PERSONNEL BY HEW REGIONS

The table shown below indicates the location of all commissioned reserve personnel, including those residing in foreign countries. The 1,430 personnel mentioned in the testimony have been integrated into the total reserve force.

Region	Total	Medical	Dental	Sanitary engineer	Nurse	Other
Foreign countries	18	4	----------	7	3	4
I [1]	152	83	13	10	17	29
II [2]	395	207	46	36	37	69
III [3]	329	118	29	42	21	119
IV [4]	195	73	17	35	10	60
V [5]	273	123	26	39	26	59
VI [6]	190	61	30	54	11	34
VII [7]	190	93	16	24	13	44
VIII [8]	97	35	12	13	8	29
IX [9]	375	165	31	59	52	68
Total	2,214	962	220	319	198	515

[1] Connecticut, Maine, Massachusetts, New Hampshire, Rhode Island, Vermont.
[2] Delaware, New Jersey, New York, Pennsylvania.
[3] District of Columbia, Kentucky, Maryland, North Carolina, Virginia, West Virginia, Puerto Rico, and Virgin Islands.
[4] Alabama, Florida, Georgia, Mississippi, South Carolina, Tennessee.
[5] Illinois, Indiana, Michigan, Ohio, Wisconsin.
[6] Iowa, Kansas, Minnesota, Missouri, Nebraska, North Dakota, South Dakota.
[7] Arkansas, Lousiana, New Mexico, Oklahoma, Texas.
[8] Colorado, Idaho, Montana, Utah, Wyoming.
[9] Arizona, California, Nevada, Oregon, Washington, Alaska, Hawaii.

Dr. SCHEELE. We are continually processing new applications. Recruitment is from private practice and voluntary organizations, universities, research centers, private industry, and State and municipal health agencies.

The training activities for this component of the Reserve Corps have included four 2-week active-duty training courses in special civil defense aspects of their future emergency assignment for a total of 142 officers.

As a matter of fact, we have a training program going on for another group who are out at Olney this very morning.

Dr. DEARING. Yes, sir; I would be out there if I were not here.

Dr. SCHEELE. It has also encompassed extensive and informative training by correspondence methods (we call it our Mail Pouch) for all Reserve officers now on inactive duty. From our experience, it

appears that the Reserve can be expanded about as rapidly as funds for training its members are appropriated.

Mr. HOLIFIELD. How much funds have actually been spent in this program? Do you have that?

Dr. HOZIER. I can furnish that to the committee.

Mr. HOLIFIELD. Fine, thank you.

(The information referred to is as follows:)

Expenditure for recruitment and training (1) in fiscal year 1955, $125,556; (2) in fiscal year 1956 to February 29, 1956, $106,900. It is expected that the remaining balance of $125,800 will be expended by the end of fiscal year 1956.

Dr. SCHEELE. Protection and restoration of community health facilities. Of major importance in this field is the matter of potable water supply under conditions far more difficult than ordinarily encountered. We must be able first to determine quickly whether or not water is pure, and, if not, what can be done to make it fit to drink.

For these studies, we have constructed a small-scale water-treatment plant at our Robert A. Taft Sanitary Engineering Center in Cincinnati.

Here we have investigated a number of methods of detecting the presence in water of biological agents, toxic gases, including the more deadly nerve gas, and of radioactive material. Concurrently, we are working to develop means and methods of removing or rendering harmless contaminants which may be found.

We are studying new techniques in filtration, alum coagulation to remove viruses, and the use of high levels of chlorination to destroy spore-forming bacteria.

In addition, as a special project, we have made a location and descriptive survey of the water systems of all larger communities in the country.

The purpose of this survey was to provide FCDA with map coordinates of these facilities for use with its electronic computer for bomb-damage assessment.

Mr. HOLIFIELD. Before we leave this, can you briefly tell us something about this deadly nerve gas? Is it a reality? Could it be extensively used in warfare?

Dr. SCHEELE. It is a reality. It was developed by the Germans as a research project during the course of World War II. And it is a highly effective, easily carried agent. I see no reason why it could not be used on us by an enemy, by a variety of devices that occur for dissemination of such chemical agents.

One might bring these agents offshore and disperse them in wind as it drifted to land. They could be carried and dropped in bombs or sprayed from airplanes. I suppose it is conceivable that there might be some method of off-loading them on beaches on our shores and bringing them into the country for dispersal.

Mr. HOLIFIELD. Does this gas have a lethal effect or it is just temporary?

Dr. SCHEELE. It has a lethal effect.

Mr. HOLIFIELD. It has a lethal effect?

Dr. SCHEELE. Yes. We might ask Colonel Guild who is an expert in this field. If the committee would like to have a further technical elaboration we could do that.

Mr. HOLIFIELD. I think we will have the chemical people in later

on. I wanted to briefly put it in the record as long as it was previously mentioned what this was.

Mr. HOLIFIELD. Proceed, please.

Dr. SCHEELE. Due to lack of funds, in the current fiscal year we were unable to work on that part of the delegation concerning the planning, development, and distribution of technical guidance on ways to minimize injury to personnel and patients in hospitals which might result from attack by chemical, biological, or radiological agents.

This phase of research would include protection of ventilating systems, disposition of contaminated tissue, and other waste products, and decontamination of facilities, equipment, and personnel. For this program we have requested $110,000 in the 1957 budget.

Mr. HOLIFIELD. Could you tell us how much was requested and spent in the 1956 budget?

Dr. SCHEELE. Yes. We are not spending any in 1956. This is a project that is not carried forward.

Mr. HOLIFIELD. This is a new project?

Dr. SCHEELE. We can give you the amount that was requested for it in the first instance. May we submit that for the record?

Mr. HOLIFIELD. Yes; please.

Dr. HOZIER. It was $110,000 requested.

Mr. HOLIFIELD. Nothing was spent. This is future plans?

Dr. HOZIER. Nothing is in the budget for 1956 that's right.

Mr. BALWAN. Was it requested in fiscal year 1956?

Dr. HOZIER. Yes; we requested $50,000.

Mr. BALWAN. You received no money from FCDA for that project?

Dr. HOZIER. That is correct.

Mr. BALWAN. Was it requested the year before that?

Dr. HOZIER. I do not know at the moment, sir.

Mr. BALWAN. Could you suppy that? You can make your statement on that.

(The information referred to is as follows:)

Project: Protection of hospital facilities, patients, and personnel

	Fiscal year 1956	Fiscal year 1957
Department request	$160,000	$160,000
FCDA request	160,000	110,000
Bureau of Budget recommendation	50,000	110,000
Appropriated by Congress	0	[1]

[1] Pending.

Dr. SCHEELE. With regard to the program whereby the FCDA is authorized to certify to the Reconstruction Finance Corporation as to the necessity under its civil defense program of making loans to aid in financing hospitals for civil defense purposes, the Public Health Service has furnished technical advice to FCDA on approximately 20 hospital plans submitted to us by that agency. Our comments are pertinent to the soundness of the architecture and construction features involving shelter and safety.

Mr. ROBACK. That program is now defunct because of the RFC being liquidated?

Dr. SCHEELE. No; it continues under another agency of government. Dr. Dearing, do you recall the agency?

Dr. DEARING. Small Business Administration has had some responsibility in that, but I am not at all certain of the current agency.

Mr. ROBACK. Do you know if there are any hospitals that have been constructed under this financing?

Dr. SCHEELE. Yes, sir.

Mr. ROBACK. How many?

Dr. SCHEELE. It will be 20 or less. We can get that for you.

Mr. ROBACK. We would like to have a short statement about what this program is.

Mr. HOLIFIELD. Can you furnish us a short statement on hospital plans which have been submitted to you by the agency. Are these just different architectural plans for your advice or are they plans for acutal locations?

(Statement supplied by Public Health Service.)

To carry out the Federal Civil Defense Act (Public Law 920, §409 81st Cong.), the Administrator of this program was authorized to certify to the Reconstruction Finance Corporation as to the necessity of providing aid in financing projects.

With respect to the approval of hospital projects under the program, FCDA Advisory Bulletin No. 126, dated September 23, 1952, titled "Federal Civil Defense Criteria Applicable to Requests for Certification of Hospital Projects to the Reconstruction Finance Corporation" specified, among other things, that hospital projects should meet the standards established by the Public Health Service in appendix A of the Federal Regulations promulgated in connection with the Hospital Survey and Construction Act (42 CFR, ch. 1, pt. 53).

An applicant for a loan for a hospital project was required to secure a statement from the State agency administering the Hospital Survey and Construction Act as to the manner in which the project fitted into the State plan and to seek guidance on the functional planning of the hospital. The State agency forwarded completed applications to the PHS regional office which reviewed them and forwarded them to this Division. The application was then forwarded with our comments and those of the regional office and State agency to FCDA headquarters.

The authority of the RFC to make loans expired on September 28, 1953. Following that, civil defense loans were made directly by the Treasury Department. The Secretary of the Treasury retained the RFC organization to process these loans. The program was in operation until April 1955 at which time it was discontinued due to the fact that no administrative funds were made available.

A total of 53 applications were submitted for RFC loans under the civil defense program to aid hospital projects. Twenty-five of those applications were reviewed by the Public Health Service. The others were filed before procedure was established requiring review by State agencies and the Service. The Public Health Service provided technical advice only but was not the approving authority. The total amount of the loans requested was $54,044,614. Of the 53 applications only 11 were approved by the RFC for a total amount of $8,118,000. Three of these have since withdrawn which means that eight hospital projects are receiving loans under the Federal civil defense program.

A list of the applications for RFC loans reviewed by this office is attached.

PROJECT APPLICATIONS FOR RFC LOANS UNDER THE FEDERAL CIVIL DEFENSE PROGRAM

North Shore Hospital, Manhasset, N. Y.
Forest Hills, Long Island, N. Y.
Clara Maas, Newark, N. J.
Chilton Memorial Hospital, Pompton Plains, N. J.
Beverly Hills, Westwood, Los Angeles, Calif.
North Adams, Mass.
Belleville, N. J.
North Jersey Hospital, Clifton, N. J.
Pascack Valley Hospital, Westwood, N. J.
Nassau Suffolk General Hospital, Copragne, N. Y.
McLeod Infirmary, Florence, S. C.
Beth Israel Hospital, Passaic, N. J.
Fitchburg General Hospital, Fitchburg, Mass.

LaMesa Community Hospital, LaMesa, Calif.
Ballard General Hospital, Seattle, Wash.
Long Beach Osteopathic Hospital, Long Beach, Calif.
Victory Memorial Hospital, North Hollywood, Calif.
LaCienaga Hospital, Los Angeles, Calif.
Memorial Hospital, Belleville, Ill.
Los Angeles Memorial Hospital, Los Angeles, Calif.
Mark E. Reed Memorial Hospital, Los Angeles, Calif.
Englewood Hospital, Englewood, N. J.
Mount Sinai Hospital, Los Angeles, Calif.
West Covina Hospital, West Covina, Calif.
Richmond Memorial Hospital, Staten Island, N. Y.

Dr. SCHEELE. These are hospitals which qualify.

Mr. HOLIFIELD. Under the Hill-Burton Act?

Dr. SCHEELE. No, sir; under the earlier RFC program for loans, because they need to expand or otherwise renovate because they are in target areas and would serve as a resource in a target area. This is outside the Hill-Burton program. These hospitals are not necessarily high-priority hospitals in the Hill-Burton program which does not take into account additional demands whch might come in a civil-defense emergency.

Dr. DEARING. But these are actual hospitals, Mr. Chairman, to answer your question. The sponsor or the owner submits a request for a loan with what he plans to build. The Civil Defense Administration is required to certify that this will meet a definite need if the loan is to be granted. We review the actual plans of—at least, have reviewed the actual plans of these 20 hospitals that were to be built to see that they took advantage of all we know about protecive construction so they would be properly built.

Mr. HOLIFIELD. These are hospitals for current hospital use, but would be available in the case of emergency for civil-defense work in target areas, and on the basis of their availability for buttressing the civil-defense program there is some type of financing which is available for them.

Dr. DEARING. There has been, and I am not sure of the current status of that.

Mr. HOLIFIELD. That is what we would like to have.

Dr. SCHEELE. This is highly limited.

Mr. HOLIFIELD. The committee is completely unaware of this program.

Dr. SCHEELE. These hospitals are private hospitals, proprietary and nonproprietary.

Mr. HOLIFIELD. We want to know what the status is, whether there has been any building of these hospitals.

Dr. SCHEELE. There has been some. I know that one hospital in the general area from which the chairman comes has received a loan under this program.

Dr. DEARING. I believe the hospital construction is a very small part of the total loan program and I think it is under the Defense Production Act which authorizes loans for the construction of industries, industrial plants, various things that are defense related and the hospitals are a very small element moneywise of what the total Government program has been. That is my understanding.

Dr. SCHEELE. The theory is that if you have a buildup of the defense industry and an influx of additional people, you might need a new or expanded hospital facility related to that defense activity.

Mr. HOLIFIELD. We know we have helped in schools in these areas and I am rather surprised to find out there is money available for hospitals.

Dr. SCHEELE. The school program is one in which there are specific funds categorically earmarked for schools. In this instance, hospitals competed for the total sums of money that might be available for all types of loans.

Mr. HOLIFIELD. Proceed.

Dr. SCHEELE. The conduct of our civil-defense program requires close coordination with other Federal agencies. We have, for example, detailed Public Health Service officers to staff the health offices of the FCDA since its inception.

We assist and advise FCDA in a number of its own programs. We participated in the studies and planning which resulted in the 200-bed hospital now standardized as the FCDA emergency hospital. We take an active advisory role in their stockpiling program of biological items.

Since the particular areas assigned us correspond to similar programs of the Department of Defense, we maintain close working arrangements with that Department.

We participate in the program of medical education for national defense, conducted jointly with the armed services and FCDA. The courses presented under this program provide realistic and practical medical instruction in mass casualty care to medical school faculties. These faculties are then able to interpret this emergency data to the medical students who are in the medical schools for their programs.

Of special significance has been our relationship with the Army Chemical Corps. We have arranged for exchange of senior staff officers and have established mutual working committees in our special fields. To provide a clear picture from the military side, orientation meetings for our top officials have been held at the Army Chemical Center, Fort Detrick and Fort Belvoir.

There has been one change in the operation of the delegation from FCDA. Originally, the Department of Health, Education, and Welfare presented to Congress its own request for appropriations for civil-defense activities.

As of last year, under instructions of the House Appropirations Committee, this function was returned to FCDA, which now prepares and presents a consolidated budget for all agencies with FCDA delegations.

I might add one additional comment to our discussion of this item yesterday. Actually for 1956 we did present the budget as a Department of Health, Education, and Welfare Public Health Service budget to the House.

The House included none of these funds and in its report said this should come up through the channel of FCDA. Then FCDA revised its budget and came up and asked for the funds. I had not pointed to that one step, our actually having in 1955 for fiscal 1956 taken the budget up as a Public Health Service budget, only to have the House take no action to appropriate 1956 funds and then the thing was put on the track again by FCDA coming up with a consolidated budget in the House.

As I stated earlier, this has been only an outline of our activity in civil defense. I have omitted such functions as our work in connection with natural disasters such as floods and hurricanes because I

understand that you are interested primarily in civil defense against enemy attack.

I will be very happy, Mr. Chairman, to try to answer any additional questions you have for me.

Mr. HOLIFIELD. Thank you very much. I think we have about exhausted the questioning field as we have gone along through your testimony.

I find we have not. Mr. Roback has a question.

Mr. ROBACK. I would like to get your observation on the retention by the FCDA of certain responsibilties in the medical field, like mass care of casualties. Is it your concept that in the event of an emergency or an enemy attack that FCDA would be directing physical resources, professional trained doctors and nurses to take care of these casualties.

Dr. SCHEELE. If the part of the Civil Defense Act which would place the Administrator in charge of direct operation of the country's program, yes, sir. Otherwise the direction would be local and State.

As far as the agency, the Federal action agency—without reference to the degree of control of the situation—it would be in the Health Division of the Federal Civil Defense Administration.

Mr. ROBACK. Do you conceive that the FCDA would be directing the personnel of the Public Health Service under that condition?

Dr. SCHEELE. You mean taking us over in a sense.

Mr. ROBACK. Yes.

Dr. SCHEELE. I can conceive that they might ask us for additional personnel. To the extent they directed programs in their regional offices and out in the States and communities, to that extent they would.

I don't expect that other than for some staff operations at a fairly high level, we would be participating much in the national program of casualty care. The people that we would loan them would be people to help in the administration of programs. Our reserve, for example, is not set up on a scale that would be of any great value to go in and give direct care to patients.

Mr. ROBACK. Do you conceive under the present Civil Defense Act that the FCDA could direct physicians and nurses anywhere in the country to do whatever they directed if enemy attack came?

Dr. SCHEELE. The decision on that is reserved to the President. He can invoke under the act direct operation by the Civil Defense Administration.

Mr. ROBACK. That is your understanding, that there isn't any bar under legislation to a Federal agency directing local facilities, local personnel to do things that the Administrator decided was necessary.

Dr. SCHEELE. No. If the President decided that the catastrophe was so great and if he decided that the State or local direction was not adequate, he could invoke direct operation from Washington or some other point. But this would be a weighed decision—I presume it would be a weighed decision. If our local echelons of control don't break down, this might not be necessary. I don't think that anybody can anticipate in advance what will be done. This is a question that could more appropriately be asked of the FCDA staff.

Mr. ROBACK. Do you have any comment to make with regard to the adequacy of the delegations that you have or of the legislation which authorizes them?

Dr. SCHEELE. No, I don't have. I don't believe we do—the Public Health Service is willing to take on as much work as we can within our resources to support the civil-defense program.

Generally I would say—this refers in part to a question raised yesterday—in my opinion there are greater advantages in having the total top responsibility in civil defense integrated in a single agency than there would be in having, for example, the Public Health Service operate in civil defense under basic statutory legislation. I believe that the problems of command and integration will best be served by the single agency approach. I heartily agree with the principles that are in the basic Civil Defense Act, however, which makes it possible for the Civil Defense Administration to avoid at any given moment being all things to all people and make it possible for them to delegate and use whatever resources and skills exist in other agencies of Government.

This to me makes very good sense and is a highly worthwhile and practical kind of program.

I think the basic questions that finally remain are the ones such as: how far do we go in civil defense, what part of the gross national product is to be devoted to this particular part of our Nation's defense. That is the ultimate question. The degree to which we develop State and local readiness, to which we have maximum ability in FCDA or in the other agencies that have delegations to do the research and carry on the work is very much dependent on these final decisions on just how important civil defense is.

Mr. HOLIFIELD. From your knowledge of the situation that exists in the United States today, you would not be in a position to state that today we have either an adequately organized health service or an adequate civilian-defense organization to discharge the responsibilities that would occur in case of a nuclear attack by a first-rate airpower.

Dr. SCHEELE. No, sir. Looking over local and State and Federal activity in general for the country as a whole, I would say that we certainly would be terribly hard pressed if we were hit by an enemy power, and I would say that we are not adequately prepared to cope with that.

Mr. HOLIFIELD. It has been the hazard of the times and it indicates that more serious thought should be given to this subject by the Congress and by our national leaders who will have that responsibility of discharging remedial measures in case such a thing occurs.

Dr. SCHEELE. Yes, sir, I believe that would be in line with my own thinking. It should be pointed out—this is known to the committee—that the forms of attack available today could be so deadly and so devastating, so tremendous, that no nation, literally, could really have 100 percent readiness to cope with it.

For example, with the potential of millions of casualties, 160,000 or 170,000 physicians, which is the supply, plus other people who would be called to support them, the veterinarians, the dentists, the osteopaths, the nurses and anyone with any little background or big background in medical training of any kind, can't suddenly be multiplied up into the half million or million health workers we might need. Besides, there will be a drain, that manpower will have a drain on it by the military forces who have the mission of striking back at the enemy.

What we are talking about is a kind of minimal preparedness.

Mr. HOLIFIELD. Recognizing the fact that there can't be a complete preparedness in view of the fact that the advantage of offense has swung so far does not excuse us, however, from taking the problem and considering it and evaluating it and doing what we can within the national capability to increase the strength of the Nation to survive the shock of nuclear warfare.

Dr. SCHEELE. That is correct.

Mr. LIPSCOMB. In regard to this plan for the Detroit hospital, this disaster plan, has that been revised since June 1951?

Dr. SCHEELE. I can't give you the answer to that, but we can call you and tell you about it and we can furnish it for the record.

Dr. DEARING. I can speak for that. They are supposed to be revised annually. We gave this to you simply because it was published at that time as a sample of the kind of things we are doing. This was published in the Journal of Hospitals of the American Hospital Association I believe.

Mr. LIPSCOMB. When a plan like this is worked out, is it worked out with the civil-defense people in the area?

Dr. DEARING. Yes, sir.

Dr. SCHEELE. Our people have all been directed to work as a part of the civil-defense team in the community.

Mr. LIPSCOMB. When the assumptions of a catastrophe are made, does the civil-defense agency in this area agree that they will assume the responsibilities that are assumed in the plan?

Dr. SCHEELE. They know the plan of this and other hospitals. I don't quite understand what you mean by responsibilities assumed, assume responsibilities. Do you mean paying for the food or furnishing food to the hospital?

Mr. LIPSCOMB. You testified to the chairman that our civilian-defense planning was inadequate, yet with reference to the plan in Detroit here, all the assumptions in this hospital plan to make them work are based on certain functions that will be carried on by the civilian-defense agencies. If they are unprepared, unable to carry through this because they have inadequate help and all, the hospital plan is of no use.

Dr. SCHEELE. That is right. If there is not an organized, well-organized civil-defense program, communications system, method of transporting patients to hospitals, if those things don't exist in a community where we have a hospital or where the other thousands of hospitals in the country are, obviously, any plan that is done locally within the hospital will be ineffective.

That is why, in using the funds available to us for these additional activities in civil defense, we have in some instances dropped research projects in favor of training and our reason for holding onto training as probably the highest priority item of all is because in any communities, any State's actual action in the event of a civil-defense emergency is going to be related to just how good the officials who run the program are.

It is those people in the State and local health field that we are directing our energies at from a training standpoint.

Mr. LIPSCOMB. Here is one I don't quite understand. This is a Public Health Service hospital and yet the plan says that advice on sanitation will be available from the civil-defense agency. I thought that Public Health would give advice to the civilian-defense people.

Dr. SCHEELE. I think maybe you are misunderstanding the role of the Detroit hospital in the national-defense program. The Detroit hospital, in the event that Detroit is attacked, is just exactly the same as Harper Hospital or Detroit Receiving Hospital or any other hospital in that community. At that moment our Detroit hospital activity will fall under the control of the civil-defense medical chief of the city of Detroit who is Dr. Molner, the city health officer, if he survives. This is not a national resource, this is a local resource.

We will not have contact with the hospital. Its big job will be to help Detroit dig out, our staff that are there will work for Detroit. In Detroit they will probably take the physicians who remain and the city health officer would deploy them among other hospitals.

This hospital happens to be at the periphery of the city. It is at the junction of the city line on the east side and depending on the size and type of attack this particular facility might actually be a worthwhile resource to that community when its bigger hospitals downtown would be gone.

We were not going to run our 14 and 15 hospitals from Washington or a central location center or provide a sanitary engineer to see whether that water supply in Detroit is polluted. In Detroit, for example, they must depend on the engineers in the civil-defense program in the health department of the city of Detroit just as will any other hospital in Detroit.

Mr. LIPSCOMB. But your assumption is that they are prepared to do such a thing.

Dr. SCHEELE. That is right. We hope they will. If they can't, it won't exist. Then the folks in the hospital will have to use their own skills to determine whether or not these things are safe or not. In other words, that is where they turn for that kind of technical help if they should need it.

Mr. HOLIFIELD. Thank you, Dr. Scheele. We will depart from our stated plan of witnesses at this time and ask Mr. William Mitchell, Deputy Commissioner of the Social Security Administration, and/or Miss Lavinia Engle to take the witness stand.

Mr. Mitchell, you have a statement to make, I believe, a prepared statement. I suggest that we start right in on that and go along as fast as we can.

STATEMENT OF WILLIAM L. MITCHELL, DEPUTY COMMISSIONER, SOCIAL SECURITY ADMINISTRATION, DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE; ACCOMPANIED BY LAVINIA ENGLE, ASSISTANT TO COMMISSIONER OF SOCIAL SECURITY ADMINISTRATION IN CHARGE OF DEFENSE PLANNING; AND PHOEBE BANNISTER, ASSISTANT CHIEF, UNIT OF DEFENSE WELFARE SERVICES, OFFICE OF DIRECTOR, BUREAU OF PUBLIC ASSISTANCE, SOCIAL SECURITY ADMINISTRATION

Mr. MITCHELL. May I introduce my associates, Miss Engle of the Commissioner's office on my right and Miss Bannister of the staff of the Civil Defense Welfare Services is here.

Mr. MITCHELL. Mr. Chairman and members of the committee, we are glad to have this opportunity to discuss with you those aspects of the civil-defense program which are the responsibility of public wel-

fare and in particular the two projects delegated by FCDA to Department of Health, Education, and Welfare for which Social Security Administration has responsibility. These projects are:

(1) Planning a national program, providing technical guidance to the States, and directing Federal activities relating to financial assistance and related services for the temporary relief and aid of civilians in a civilian-defense emergency.

(2) Planning a national program and providing technical guidance to the States and directing Federal activities relating to distribution of and payment for clothing for civilians in a civil-defense emergency.

Mr. BALWAN. Is this a paraphrasing of the delegations as they actually are in the register or is that the exact delegation?

Mr. MITCHELL. That is a paraphrasing of the delegation, although it runs very closely to the original wording.

Since these delegations are in the program area for which the Bureau of Public Assistance is our operating bureau, the Commissioner of Social Security Administration on December 21, 1954, assigned to the Bureau of Public Assistance responsibility for them.

It may be useful for me to describe for you briefly the organizational structure through which the Federal-State welfare programs operate. The Social Security Administration has responsibility for the principal Federal welfare programs, these falling under two major headings.

(1) Grants-in-aid to the States for public assistance and services; and

(2) The federally administered old-age and survivors insurance program.

The grants-in-aid programs are for certain categories of public assistance, aid to the aged, the needy blind, dependent children, and the permanently and totally disabled.

These programs are State programs, established by State law, and if they conform to the purposes and requirements of the Federal law—that is the Federal Social Security Act—the expenditures by the States are matched by the Federal Government under varying formulas.

Administrative costs of the States are matched on a 50–50 basis.

A requirement of the Social Security Act is that the programs matched by Federal funds shall be available to all persons who qualify and consequently that the State agency's operation shall extend to every county and city within its jurisdiction.

As a result of this we now have a public welfare system in the United States that is in operation in every State and in every political subdivision in every State and in the Territories of Hawaii, Alaska, Puerto Rico, and the Virgin Islands.

These State and local agencies are staffed by trained personnel and are in touch with the people of every section, however remote, of the United States. They operate under the rules and regulations of a Federal-State local fiscal system for the handling of grants-in-aid moneys.

The federally administered OASI program is operated through 9 regional offices and 538 local district offices. I might add also through 6 area offices where claims are paid.

We are, as you may see, a decentralized operation. Since our job is service to people either directly or through the State agencies, we

believe that this is the efficient and practical way to get the job done.

The organizational structure was invaluable in carrying out World War II responsibility which we were given for civilian war assistance and war benefits; field direction of the community war services program; assistance to the selective service and services in connection with repatriation of Americans.

Since the beginning of the civil-defense program, the Social Security Administration has consulted with FCDA, in connection with the development of civilian defense welfare plans. With the assignment to us of responsibility for these two welfare programs, our first undertaking was to analyze information relating to the attack assumptions and the materials available from which we could define the dimensions of the situation following a massive enemy attack. It has been estimated that as many as at least 20 million people would be homeless in addition to those killed or injured.

Mr. HOLIFIELD. On that point, Mr. Mitchell, what is the basis of that statement?

Mr. MITCHELL. I believe that is based on estimates which we were given by more knowledgeable people than ourselves. It is a proportion of the population in the cities that would be bombed under certain assumptions and the proportion of the population in those cities who would be expected to be in need of these services.

Mr. HOLIFIELD. Was that as a result of the estimate contained in the Operation Alert exercises?

Miss ENGLE. It was both in that and in basic assumptions of the year's planning issued by FCDA at the time the delegation was assigned to us.

Mr. HOLIFIELD. So the authority for this figure is the FCDA?

Mr. MITCHELL. Yes.

Mr. ROBACK. It is not clear whether this is a minimum or a maximum, since he has both "as many as" and "at least" in there. Does he mean it is a minimum or a maximum?

Mr. MITCHELL. It is a minimum.

Mr. HOLIFIELD. Then we would want to strike out "as many as"; would we not?

Mr. MITCHELL. Yes, sir; I think that would be a more accurate statement.

Mr. HOLIFIELD. All right.

Mr. MITCHELL. These people would be in need of the essentials for survival, shelter, food, and clothing; they would require direct and immediate assistance, both material and later financial, welfare and medical services to enable them to get back on their feet and continued help until they were able to either return to their homes or to locate new ones. The injured on release from hospitals would require the same services.

Children whose parents had been killed or lost, older people, the injured and the infirm, all of these would need assistance if they were to survive.

The job as we see it is to develop plans which will insure in the event of an emergency the maximum use of the total welfare organization of the Nation, Federal, State, and local and plans which would supplement this staff of some 80,000 persons with the staff of private social agencies, volunteers, and those public agencies whose work would be suspended during such a period.

Mr. HOLIFIELD. In other words this task of assistance in case of this type of emergency would involve the total mobilization of all of our resources, would it not, in the field of volunteer help, local organization, church, civic groups, charitable groups, everything that we have in the Nation?

Mr. MITCHELL. Exactly.

Mr. HOLIFIELD. And if that mobilization is not in being and the possibilities of putting it in being, it would mean that we would be utterly incapable of an orderly aid to these people, to these homeless people.

Mr. MITCHELL. I would say so.

Mr. HOLIFIELD. In other words chaos and confusion would reign in our civilian centers of population.

Mr. MITCHELL. I can see nothing else.

Mr. HOLIFIELD. Do you believe at this time that there is such an organized force in being to do this administration of aid?

Mr. MITCHELL. Oh, no, not at all.

Mr. HOLIFIELD. We are completely disorganized in the United States.

Mr. MITCHELL. Almost completely unorganized. I believe in the States of New York and California for instance, through State action there has been a substantial amount of work done by way of research and planning and some organization.

Mr. HOLIFIELD. But I can testify from the standpoint of my own city and my own community that there is absolutely no such preparation as envisaged in your statement here.

Mr. MITCHELL. I believe that is a correct statement.

Mr. ROBACK. Can we find out from the witness his concept as to who would be the directing authority in the event that these conditions existed?

Mr. MITCHELL. In the States?

Mr. ROBACK. You are talking about total mobilization. Who would be directing this total mobilization?

Mr. MITCHELL. Within this particular field that we are talking about, what we envision is that the basic planning would be done federally through our delegations here, although they are not complete—there are other things to be done. Within the States the State director of public welfare, functioning in coordination with the field organization of the FCDA——

Mr. ROBACK. Who is in charge when the bell rings?

Mr. MITCHELL. In this area, the States. The State director of public welfare and his organization throughout the State, as I have already indicated, is State-county, statewide to the local municipality.

Mr. ROBACK. Do you conceive that anybody in the Federal Government could tell the State how the resources should be deployed?

Mr. MITCHELL. Not tell them, but we could work with them.

Mr. ROBACK. I mean direct them.

Mr. MITCHELL. Well, yes, the agreement that we have recently developed, and one which we will soon be consulting with the States about getting it signed, would provide in this area for them to accept direction on a national basis from a national headquarters, and we would undertake to develop a plan with the States that would take into account a chain of command.

Mr. HOLIFIELD. But you have not developed that plan as of now.

Mr. MITCHELL. Just in the outlines. It is on the planning boards. It is not a reality by any means.

Mr. HOLIFIELD. We are asking what the present status is. Have you developed a plan such as you envisage here and submitted it to any one State in the United States?

Mr. MITCHELL. I would have to answer that this way. We have developed a plan formally as of now, which we propose to negotiate into existence with each State.

Mr. HOLIFIELD. Have you negotiated with any State on these plans?

Mr. MITCHELL. We have negotiated with them in the development of overall plans so far but we do not have a signed agreement yet.

We only formally and finally approved the agreement form about 2 or 3 weeks ago.

Mr. HOLIFIELD. You do have that completed then?

Mr. MITCHELL. Yes, sir.

Mr. HOLIFIELD. You are now at the position where you will start to take this up with your State officials and consult on an agreement?

Mr. MITCHELL. That is right.

Mr. HOLIFIELD. Do you understand that your Department of Health, Education, and Welfare has the responsibility for these plans, and that it will be up to them or up to you to carry them out?

Mr. MITCHELL. Yes, under delegation No. 1 in these restricted areas of cash assistance and clothing.

Mr. HOLIFIELD. That is only in the areas of cash assistance and clothing?

Mr. MITCHELL. And clothing.

Mr. HOLIFIELD. All right. I hope your testimony will get to the point of how much cash you have to assist with and how much clothing you have to assist with.

Mr. MITCHELL. Yes, sir.

Mr. HOLIFIELD. Does your statement take care of that?

Mr. MITCHELL. In a rather negative way but it covers that point.

Mr. HOLIFIELD. Most of the testimony we are getting is in a negative way. So this won't be any surprise to us. But we would like to have an affirmative statement of how much money you have to help in this field and how many pieces of clothing you have or at least how many beings you can clothe in an emergency? Can you give us those figures?

Mr. MITCHELL. Well, may I suggest this: That I cover that point as I had planned and then to the extent that you find it deficient you can ask the questions.

Mr. HOLIFIELD. All right, proceed. We will develop it.

Mr. MITCHELL. As you know, following issuance of the delegation a special appropriation was made to DHEW for the remainder of fiscal year 1955 and with these funds we established a unit for Defense Welfare Services planning in the office of the Director of the Bureau of Public Assistance.

This Defense Welfare Services unit has gone forward, with the assistance of other staff, with analysis and clarification of the content of the delegation, planning as to the staff needed to carry on the work, conferences with the State welfare departments, and other groundwork necessary to get a sound basis on which to get the job moving.

The necessary work for establishing the positions with civil service, security clearance, and so forth, was set in motion, and a central

office staff recruited and put to work. For fiscal year 1956 an appropriation to FCDA was allocated to the several departments for carrying out delegations and work has continued to move forward.

Accomplishments to date, after this initial and essential organizational work, include development, in conference with FCDA, of a memorandum of understanding between FCDA and DHEW which interprets and clarifies the broad general language of the delegation and establishes a firm policy base for formulating the program. This was signed by the Secretary of DHEW and the Administrator of FCDA on December 16, 1955.

Mr. HOLIFIELD. Let's go back to the previous paragraph there where the sentence reads:

> For fiscal year 1956 an appropriation for FCDA was allocated to the departments for carrying out delegations and work has continued to move forward.

What departments are you speaking of there and how much was the appropriation?

Mr. MITCHELL. The appropriation we are talking about was an appropriation to FCDA made by Congress, the amount of which I am not familiar with. The allocations to the departments that I am referring to are the departments who were functioning under delegations made by FCDA.

Mr. HOLIFIELD. This is a general statement then; this does not relate to your particular department or your particular function.

Mr. MITCHELL. It does in the sense that we were one of those receiving allotments of funds.

Mr. HOLIFIELD. What was your allotment?

Mr. MITCHELL. For 1955 it was $138,000.

Mr. HOLIFIELD. What was this for? Was this for planning and the purchase of clothing?

Mr. MITCHELL. It was for planning but not for the purchase of clothing. It was for essentially the employment of staff and miscellaneous expenses designed to get the core of the planning organization set up.

Mr. HOLIFIELD. What was that for 1956?

Mr. MITCHELL. $135,000.

Mr. BALWAN. Are you talking about fiscal year moneys here?

Mr. MITCHELL. Yes, sir.

Mr. BALWAN. What is your appropriation for fiscal year 1957, what is the request for?

Mr. MITCHELL. The request before Congress is $200,000. I understand that that is included in a much larger request by FCDA for all the delegate agencies and that the action in the House resulted in a cut. The extent to which we would be involved in that cut has not been made known to us.

Mr. BALWAN. All right, proceed.

Mr. MITCHELL. On the basis of this understanding, an interim statement on program and administrative planning for emergency financial assistance and clothing has been developed and sent to all State Welfare departments.

This statement spells out the policy contained in the memorandum of understanding and will serve as the basic document for the State agencies in the development of their plans for the programs pending the completion of a detailed manual.

Mr. HOLIFIELD. May we have for our records a detail of the plans which you have worked out?

Mr. MITCHELL. Yes, sir; I have a copy with me and I can hand it right over to the reporter now.

Mr. HOLIFIELD. We have it right here. The staff furnished me a copy of it.

Mr. BALWAN. Do you want that included in the record, Mr. Chairman?

Mr. HOLIFIELD. I think we might include that in the record at this point without objection as it is a plan that he is testifying on.

(The document referred to is as follows:)

DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE,
SOCIAL SECURITY ADMINISTRATION,
Washington, D. C., March 16, 1956.

STATE LETTER NO. 264

To State agencies administering approved public-assistance plans.
Subject: Defense welfare services—Interim Statement on Emergency Financial Assistance and Emergency Clothing.

This letter transmits the Interim Statement on Emergency Financial Assistance and Emergency Clothing, to which reference was made in the last paragraph of State Letter No. 262 dated January 5, 1956.

The Bureau wishes to take this opportunity to acknowledge gratefully the generous assistance and valuable ideas which State public-assistance agencies contributed to the development of this document. In the process of expanding the interim statement into a manual, we shall continue to look to you for suggestions and advice.

The interim statement is intended to serve both Federal and State agencies as a statement of Federal policy, as a basis for further program planning, as staff orientation material, and as a set of standard operating principles to be applied in civil-defense test exercises. The statement may also serve as a guide for adapting present State procedures in case of a civil-defense emergency.

With the interim statement, we are issuing a model Federal-State agreement. Such an agreement, when signed by the appropriate State officials and the Commissioner of Social Security, will formalize the relationship between the State public-assistance agency and the Bureau of Public Assistance in the planning and operation of emergency financial assistance and emergency clothing.

The use of a written agreement for the delegated welfare functions has been selected instead of some other device (e. g., a State plan) as more suited to the need for flexibility in program development in defense welfare services. Prior to its issuance, the model agreement was tested in 6 States in 2 regions.

The regional representatives of the Bureau or designated members of their staffs will be glad to discuss with you any comments or question you have regarding the interim statement and the model agreement.

The letter relates to State Letter No. 262.

Sincerely yours,

JAY L. RONEY,
Director, Bureau of Public Assistance.

DEFENSE WELFARE SERVICES—INTERIM STATEMENT ON EMERGENCY FINANCIAL ASSISTANCE AND EMERGENCY CLOTHING

I. INTRODUCTION

A. Purpose of interim statement

The purpose of this statement is to present in one document certain basic material which has been developed in nationwide planning for the civil-defense welfare programs of emergency financial assistance and emergency clothing. Thorough planning in advance is essential if these two programs are to play their vital role in conserving and sustaining the Nation's human resources in the event of enemy attack on target areas with conventional or nuclear weapons.

Just as the interim statement is a product of consultation between staff of the Bureau of Public Assistance and State public-assistance agencies, it is intended to serve both State and Federal agencies as a basis for planning and for training in the interval before a manual is issued.

B. Legal base

The legal base for the entire emergency welfare program, including emergency financial assistance and emergency clothing, is section 3 (b) of the Federal Civil Defense Act (Public Law 920) of 1950, which includes "emergency welfare measures" in the term "civil defense." Another reference to welfare is contained in section 303 (e), which authorizes "financial assistance for the temporary relief or aid of any civilian injured or in want as the result of any attack."

Section 2 of the act declares it to be the policy and intent of Congress that "responsibility for civil defense shall be vested primarily in the several States and their political subdivisions. The Federal Government shall provide necessary coordination and guidance; shall be responsible for the operations of the Federal Civil Defense Administration as set forth in this act; and shall provide necessary assistance as hereinafter authorized."

Section 201 (b) authorizes the Federal Civil Defense Administrator to "delegate, with the approval of the President, to the several departments and agencies of the Federal Government appropriate civil-defense responsibilities, and review and coordinate the civil-defense activities of the departments and agencies with each other and with the activities of the States and neighboring countries."

Section 201 (i) of the act prohibits contributions by FCDA for State and local personnel and administrative expenses except as specified in section 303 (d) in a national emergency for civil-defense purposes.

Two sections of the act, 401 (c) and 405, provide for utilization by the Federal Civil Defense Administrator of the services, facilities, and resources of Federal agencies and, with their consent, the services, facilities, and resources of State and local agencies.

C. Administrative authority and organization

In accordance with section 201 (b) of the act, quoted above, the Administrator of Federal Civil Defense on July 14, 1954, delegated to the Department of Health, Education, and Welfare certain civil-defense responsibilities. Among the responsibilities delegated to the Department are the emergency welfare services of financial assistance and clothing.

Since the delegation to the Department is drawn in broad, general terms, a memorandum of understanding was formulated and signed by the Secretary of Health, Education, and Welfare (October 13, 1955) and by the Administrator of Federal Civil Defense (December 16, 1955). This document and the delegation itself form the basis for plans, policies, and instructions for the delegated welfare programs.

Within the Department of Health, Education, and Welfare, responsibility for planning programs of emergency financial assistance and emergency clothing has been assigned to the Social Security Administration, and within the Social Security Administration to the Bureau of Public Assistance. The preemergency responsibility of the Bureau comprises nationwide planning and coordination and technical assistance to States to make nationwide planning effective within the broad policies established by the Federal Civil Defense Administration. In carrying out its responsibility, the Bureau will depend upon State public-welfare agencies in the planning, organization, and operation of these programs.

To formalize this working relationship with the States, a model agreement, which is appended to this statement, has been drawn up. The use of agreements has been adopted for the delegated programs instead of State plans, which are required for old-age assistance, aid to dependent children, aid to the blind, and aid to the permanently and totally disabled.

In many States, the public welfare agency, within the State civil-defense agency, is responsible for the total program of emergency welfare services, including emergency financial assistance and emergency clothing. Insofar as the total State civil-defense program is concerned, the objective of the Bureau of Public Assistance is to strengthen and support the State welfare agencies in their planning for emergency financial assistance and emergency clothing as part of the State civil-defense organization.

Planning for emergency financial assistance and emergency clothing must be consistent with the objective of the total emergency welfare program, and must be coordinated with other civil-defense services. The civil-defense emergency welfare program as a whole is designed to minimize the effects of enemy attack

by providing persons in want as a result of attack with food, shelter, and clothing and by assisting them in reuniting their families, in reestablishing family life, and in making their contribution to the recovery of the Nation. To accomplish this broad mission, it is evident that the various parts of the emergency welfare program will have to be complementary and, in addition, that the emergency welfare program as a whole must be closely coordinated with all the other civil-defense services, particularly supply, transportation, health, communications, police, and warden.

II. CONDITIONS UNDER WHICH THE DELEGATED PROGRAMS MAY OPERATE

In planning for civil defense we are working in a highly speculative field. Because we do not know the size and combination of weapons that might be used or where and when the attack might occur, we cannot fully anticipate or assess the damage that an attack with nuclear weapons would accomplish or the magnitude of the job that would face us. We know that plans must be made in advance, that they must be highly flexible and in terms of large-scale operations, and, at the same time, as realistic and as definite as possible. Plans developed must not remain static, but must be periodically reviewed and changed as may be necessary in the light of new knowledge and experience. Policies for emergency financial assistance and emergency clothing are best understood against the background of conditions under which the programs may operate.

The planning assumptions listed below have been adapted from current planning assumptions prepared by the Federal Civil Defense Administration for the period from July 1, 1955, to June 30, 1956. On the whole, however, the FCDA planning assumptions, which are broad and national in scope, will generally apply to civil-defense planning for a longer period of time than fiscal year 1956.

A. Planning assumptions related to nature and extent of problem

The following circumstances, although not definitive, indicate the nature and possible extent of the problem:

1. Concentrations of population and industry as well as bases of military retaliation will be primary targets for nuclear attack.
2. Civil-defense measures against nuclear attack will include the evacuation of target areas where that is feasible.
3. Radioactive fallout will not only contaminate the areas struck, but will spread over areas downwind from the bursts.

Although warning of attack will be limited, time may be sufficient for evacuation of portions of the population of target areas. Consequently, large numbers of people from those localities will need care in outside communities. Both the areas attacked and areas in which evacuees must be cared for will require outside support in personnel and material.

Planning for evacuation and reception must take into account the need for protection from radioactive fallout. In the communities outside target areas, extensive use will have to be made of all kinds of housing facilities including family dwellings. Under the circumstances prevailing after an attack, it is probable that makeshift arrangements will have to continue for a substantial period of time.

B. Planning assumptions directly related to emergency financial and clothing needs

On the basis of the conditions outlined above, the following assumptions are applicable regarding emergency financial and clothing needs:

1. Vast numbers of people will suffer personal, financial, and property losses.
2. Income payments of all kinds will be interrupted.
3. Many people evacuated from target areas will need clothing.

Although preattack evacuation will substantially reduce the number of casualties, it is evident that losses of all kinds will be heavy. Evacuees, scattered over considerable distances, will be separated from family and friends. Even if not physically injured, they will be suffering from severe emotional shock. Their homes and personal belongings will have been demolished.

As a result of the destruction of facilities and loss of personnel, income payments from employment, investments, private insurance, social insurance, public assistance, and other sources will be interrupted.

Large numbers of evacuees will be in need of clothing. With the possibility of very limited warning time, many who happen to be at home when the warning

is given will not take with them the amount and kind of clothing required in the conditions they will face. Those who start from offices, stores, and factories will be even less prepared. Lack of adequate shelter from cold, rain, and snow will increase the need for warm, protective clothing. Among those in special need will be babies, children, expectant mothers, the aged, and the disabled. Clothing contaminated by radioactive fallout will have to be replaced.

C. Planning assumptions regarding welfare and clothing resources

The following assumptions have been made regarding resources for meeting emergency financial and clothing needs:

1. Public and private welfare agencies in areas that are attacked will suffer losses in personnel, records, facilities, and physical equipment.
2. Clothing stocks in target areas will be destroyed or contaminated.
3. Normal channels for supply and distribution of clothing will be disrupted.

With their local and State offices in target areas destroyed and casualties among their personnel, the operation of public-assistance agencies will be further handicapped by comparable losses in fiscal and other supporting governmental services. The community resources normally provided by cooperating voluntary agencies will, in the main, not be functioning for some time after the attack. Surviving personnel of such agencies will undoubtedly, by preattack arrangement, assume appropriate roles in the civil-defense program.

Destruction of stocks of clothing in attacked areas will deplete the Nation's clothing resources to a very serious extent. As most of the large retail clothing stores and many of the manufacturing establishments are located in the downtown sections of cities, substantial destruction may be expected. Casualties among clothing personnel along with losses in facilities and equipment will disrupt distribution. Damage to railroads, highways, bridges, docks, and rolling stock will disrupt the normal flow of supply.

III. EMERGENCY FINANCIAL ASSISTANCE

A. The delegation

The delegation by Federal Civil Defense Administration to the Department of Health, Education, and Welfare reads as follows:

"Plan a national program, develop technical guidance for States, and direct Federal activities concerned with financial assistance for the temporary relief or aid of civilians injured or in want as the result of attack."

B. Scope of the program

Section 303 (e) of the Federal Civil Defense Act of 1950 is the specific authority to "provide financial assistance for the temporary relief or aid of any civilian injured or in want as the result of any attack." In accordance with the language of the act, any civilian will be eligible for emergency financial assistance if in want as a result of attack. The results of an attack may be felt not only by persons in the immediate vicinity of the attack but also by persons living far away. Persons living at a distance, for example, may be in want as a result of attack (1) if those on whom they have depended for support are killed or injured in the attack or are missing or unemployed because of it, or (2) if resources from business enterprises, annuity payments, social-security benefits, and the like are interrupted or discontinued as a consequence.

To accomplish the objective of "relief or aid," financial assistance has been interpreted to include services related to the giving of financial assistance on a basis that will facilitate reestablishment of home and community life and restoration of productive activity. The type and amount of services provided will depend upon conditions prevailing during the emergency. The volume and urgency of requests will undoubtedly far exceed the availability of staff and resources. Operation of the program in hastily improvised locations with primitive facilities will be a further handicap. Under such conditions services will largely be of the short-contact type, aimed at easing the immediate stress of the emergency experience and assisting affected individuals to use their capabilities and available resources to reestablish themselves and their families and to contribute to community and national recovery. Families or individuals evacuated from attacked areas may need help in working out changes in living arrangements, and help in arranging for temporary boarding care may be required for aged and handicapped persons and for unaccompanied children. Many people in financial need will have to have information and direction in getting to emergency facilities for medical care. Persons in need of financial assistance will require the assur-

ance that comes from the receipt of information about what is being planned to assist in reuniting families, recovering personal losses, and restoring sources of income. Counsel and suggestions may be necessary in many situations to foster adjustments to personal distress and losses, to emergency living conditions, and to other difficulties that prevent self-help and direction.

The period during which the emergency financial assistance program may operate cannot be defined in precise chronological terms. The program will go into operation when "a state of civil defense emergency" is "proclaimed by the President or by concurrent resolution of the Congress" (Federal Civil Defense Act, sec. 301). Emergency financial assistance as a program will end when the state of civil defense emergency is terminated as provided by law.

The length of time during which temporary aid will be given to any person will vary in acordance with each individual's situation. For each person assistance will begin at any point at which his requirements can be met at least in part through financial assistance and service. Aid under this program will end when he no longer needs assistance or when assistance is available to him through some regular public assistance or other income maintenance program.

C. General principles of administration

Since no one can predict with any degree of accuracy how many people will be in need as a result of attack, where they will be located, and all the types of goods and services they will need, plans must be so drawn as to permit great flexibility in all phases of operation. If morale is to be sustained, needs of people must be recognized and met as promptly and as adequately as conditions permit.

In the period immediately following attack, practically every applicant from the vicinity of the attack will be presumptively eligible under the broad coverage of this program. Moreover, exploration of eligibility of evacuees in the stress of the immediate situtation will be impossible and inappropriate.

In the case of civilians in need as a result of attack who are far removed from the attacked area and for all persons receiving assistance after the immediate disaster period, information may be needed as in the regular operations, to support continuing assistance and individualized planning. For these cases, emphasis should be placed on exploration and development of potential resources, recovery of resources lost because of attack, reestablishment of sources of support by reuniting family members, and conservation of working tools and capital. Resources should be considered in determining need only if and when immediately available to meet need.

Requirements for survival and for special purposes should be considered in accordance with the following principles:

1. The survival requirements, such as food, shelter, clothing, and personal incidents, may be authorized to the extent that supplies are available for purchase without detailed inquiry and evaluation, particularly in the immediate post-attack period.

2. In the interest of national recovery, emergency financial assistance to promote self-help and return to family and community living should also be provided. Provision of special requirements, such as tools and transportation, would involve consideration with the applicant regarding the purpose of the requirements in his plan for self-help and the practicality of the plan in the face of shortage and controls.

In the absence, for the present, of national assistance standards for requirements in this program, State agencies may use as guides the standards applied in the public-assistance programs. State public-assistance standards for requirements would, in all probability, require adaptation to emergency conditions. Assistance that is received through other programs, such as medical care and clothing, should not be duplicated, of course, in amounts authorized for emergency financial assistance.

Emergency financial assistance is expected to make it possible for people to obtain the necessities of life, to manage their own affairs, and to contribute to national recovery. As a temporary program, it is not intended to restore individuals to their previous circumstances and to replace all their losses.

Persons who have been receiving public assistance, old-age and survivors insurance, railroad retirement, veterans' benefits, and other types of payments will be eligible for emergency financial assistance until regular payments under these programs are resumed. Thereafter, they will be eligible for emergency financial assistance only to meet special or additional requirements resulting from the attack.

The effectiveness of economic controls and related circumstances will determine whether it will be necessary to use vendor payments or orders for all or some commodities and services in the initial period after attack while economic patterns are disrupted and certain commodities are in short supply. Beyond the initial period, the vendor payment may continue to be the best way of giving assistance in special situations. The money payment method will be used insofar as possible. Through this method of payment (cash, checks, or warrants), the responsibility of the individual for directing his own affairs is recognized and encouraged.

While methods of financing have not been developed in detail, it may be assumed that Federal funds for this program will be advanced to States if the States find it impractical to operate the program on a reimbursement basis. It may be more expeditious, however, for the States to use their own funds in providing assistance subject to full reimbursement from Federal funds (see memorandum of understanding, section III, 1).

The State agency will be accountable for Federal funds made available under this program. Its records should reflect program receipts and disbursements and the basis for claims against the Federal Government. Because of the emergency nature of the financial-assistance program and the conditions under which it will operate, a simple accounting procedure that will facilitate the recording of financial transactions would be acceptable, and is recommended. The system currently in effect in State and local public-assistance agencies may be used in this program if practicable. Adaptations may, however, be necessary to permit the most expeditious recording of financial transactions.

The Federal audit will be limited in scope to those verifications necessary to assure accountability, and will not be directed toward review of administrative decisions. The State expenditures must be supported by proper authorizations and, when cash is given or goods are furnished, by evidence of receipt by the recipient. Until a decision is reached as to the desirability of standard authorization and order forms, States should proceed in planning on the assumption of adaptation of present authorization forms and procedures.

Required reports will be the minimum necessary for planning, making fiscal estimates, and accounting for funds received and expended. Reports will conform insofar as possible to current public assistance reporting definitions and procedures.

The nucleus of the operating staff of the emergency financial assistance program will be the entire staff of the public assistance agency—administrators, supervisors, caseworkers, fiscal and clerical personnel. In a major emergency, this nucleus will have to be expanded with all the trained and experienced social work staff available as well as with many people from related fields, such as employment counselors and claims examiners skilled in short-contact interviewing. In addition, many volunteers without previous experience in public assistance or related fields will be needed. The public assistance agency should take leadership in planning with other social welfare agencies, with related organizations, professional groups, and associations in bringing personnel into the program, in training workers for the program, and in recruiting volunteers.

The State public assistance agency responsible for planning emergency financial assistance should anticipate statewide operation as well as concentrated effort in attacked areas. The State agency should have authority to supervise or administer the program directly in local communities. Since large concentrations of civilians in want will greatly overextend the resources of local staff, the State agency must be prepared to relieve the situation with trained staff from other areas. While the greatest concentration of civilians in want will occur near attacked areas, some may be found in any community in the country.

So that emergency programs may be put in operation without delay, it is important for State agencies and local agencies in target areas to plan alternate headquarters provided with basic equipment and supplies.

Close coordination of emergency financial assistance with all other activities in civil defense, particularly with the other services in emergency welfare, is of the utmost importance. Staff in emergency financial assistance must be ready to operate with the directors and other personnel in reception areas; they must use and support registration and inquiry services; they must know the organization and function of the various medical services. Planning of the program must also gear in with total survival plans and with plans for transportation and supply.

Not only is close coordination of all civil defense planning within the State essential, but there is also necessity for interstate planning. In an emergency, any State may need help from another, and to be most effective this cooperation should be planned in advance.

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IV. EMERGENCY CLOTHING

A. The delegation

The delegation by Federal Civil Defense Administration to the Department of Health, Education, and Welfare reads as follows:

"Plan, program, and develop technical guidance for the States and direct Federal activities concerned with the acquisition, transportation, and payment for clothing of civilians in want as a result of attack."

In the memorandum of understanding between Federal Civil Defense Administration and the Department of Health, Education, and Welfare, the emergency clothing program has been interpreted to be "a temporary program of distribution in kind to persons in need immediately after attack, of new and/or used wearing apparel." "Acquisition, transportation, and payment for clothing are functions carried on in concert with and supported by other services of civil defense at national, State, and local levels of operation." To defray the cost of clothing, "the Federal responsibility will be met with 100 percent Federal funds."

As stated in I B, of this document, section 3 (b) of the Federal Civil Defense Act is the legal authority for this program.

B. Scope of the program

Even in a great emergency, the preferred method for meeting the need of people for clothing is through financial assistance. However, in view of the destructive power of modern weapons and the immediacy of the need for wearing apparel by vast multitudes of people as a result of attack, the more expeditious method of distribution in kind is necessary.

For purposes of a program of distribution in kind, the word "clothing" has been interpreted to include both new and used wearing apparel, outer and under garments, shoes, headgear, socks and stockings, infants' wear—items which will give warmth and protection from the elements and preserve a modicum of decency. Blankets are not included, although they will be used extensively as protective covering in an emergency (blankets are currently being stockpiled by FCDA and the States for use in emergency hospitals and congregate lodging facilities). Special clothing used by civil defense forces—fire, police, rescue, radiological monitoring, and others—is not included.

All civilians directly affected by attack and in need of clothing are eligible for clothing as defined above. As the program is designed to relieve immediate need, the length of time it will be in operation will be brief. It will be effective upon the proclamation of "a state of civil defense emergency" (Federal Civil Defense Act, sec. 301). The program will operate until the need for clothing can be met through emergency financial assistance.

C. General principles of administration

To alleviate suffering that will arise under the conditions described in II, *B*, clothing needed immediately must be provided at once. The speed with which the program can be put into effect will depend upon the thoroughness and flexibility of the advance planning.

In almost all instances, on-the-spot observations combined with knowledge of the attack and ensuing conditions (see sec. II) will provide sufficient evidence to determine eligibility. The scope of assistance under this program will be based on immediate provision of articles of clothing required for survival and personal hygiene.

For present planning, reliance in the period immediately following attack should be placed on use of undamaged stocks of new clothing available in retail stores and other commercial establishments near the attacked area and in the surrounding areas. Further study of the probable extent of need and of clothing supplies which may be available may indicate the necessity of some change in this policy. Furthermore, what might be realistic planning for one metropolitan area might not be so for another.

Agency planning should take into account the fact that shortages in new clothing will be compensated in some measure by sharing of clothing supplies on a person-to-person basis in support areas, by decontamination of radioactive clothing and by collection of used clothing on a planned basis from unaffected areas.

As primary reliance under present policy will be on use of undamaged stocks of new clothing, plans for collection and handling of used clothing should be made on a standby basis, primarily as an activity of communities at some distance from targets and immediate support areas. Standby plans should not

be implemented until an attack has occurred and it has been determined that supplies of new clothing will not be adequate. Plans should provide for used clothing to be cleaned, repaired, sorted, tagged, bundled, and ready for use before consignment to distribution points.

Location of distribution points should be planned in or near areas for assembly of evacuees. After an attack, large groups in immediate need will be found at first-aid stations and at emergency hospitals awaiting discharge. Distribution points should be equipped for orderly storage of clothing stocks, and should be arranged to handle large numbers of people quickly and efficiently.

The role of the State public welfare agency in the emergency clothing program will be much the same as in emergency financial assistance. Responsibility for planning and for directing and operating the program in an emergency will be centralized in the State agency. Planning will encompass designing the organizational structure for operations, estimating requirements for clothing supplies, identifying sources of clothing, and determining requirements for transport. The methods of discharging the State agency's responsibility for emergency clothing will differ from the methods applied in emergency financial assistance in the high degree of technical experience and skill to be drawn from outside the agency; i. e., from the retail clothing field, as noted below.

The details of the interrelationships between this program and the supply and transportation services of civil defense have not been fully developed at the Federal level. In any event, the division of responsibility at the State level would depend on the State civil defense organizational structure. If the civil defense organization provides that the supply service will operate as the overall requisitioning unit, its function would be similar to that of the central purchasing departments, which are to be found in many States and cities and with which public welfare agencies are familiar. Under such an arrangement, the public welfare department would assist the supply service, in the planning phase, in identifying sources of clothing. In the operational phase, the supply service will procure the clothing requested by the public welfare agency. The supply service will deal directly with the transportation service in arranging for the movement of such clothing to the locations designated by the public welfare agency.

Financing of the emergency clothing program will, in general, follow the same pattern as the financing of emergency financial assistance. The procedure to be followed has not yet been formulated in detail. It may be assumed, however, that funds or credits will be available for State agencies to apply to the purchase of clothing in bulk.

As the responsibile State office, the public welfare agency will be accountable for the expenditure of funds or credits allotted for the program. As in the emergency financial assistance program, records and reports to support expenditures will be required. Inventory procedures will also be needed to account for stocks of clothing that will be stored at distribution points.

Pending the development of forms and reports specifically for this program, State public welfare agencies may be able to adapt procedures and forms used in normal operations—for example, requisition, invoices, and voucher forms—for emergency operations in event of a crisis.

Planning and operation of the emergency clothing program requires the full participation of groups with specialized knowledge of the field of clothing and textiles. Some of the eseential technical knowledge may be available within State and a few large city public welfare agencies which employ personnel trained in home economics. In many agencies, however, such consultation may not be available. Even where this type of knowledge is regularly available, it is necessary to the success of this program that additional talent be enlisted.

In accordance with present nationwide planning, the core of this specialized talent to plan the program and to staff distribution centers will be drawn from the retail clothing field. Other sources of experience in clothing include manufacturers and jobbers, voluntary agencies with experience in used-clothing programs, and home economics in schools, colleges, industries, agencies, and institutions.

Specialized knowledge of clothing will be invaluable in advance program planning in such activities as estimating volume and transportation requirements, in location of potential distribution points, in developing diagrams, layout and flow charts. One of the most valuable byproducts of this teamwork will be the strength gained for the program as a result of an understanding of its vital importance on the part of clothing retailers and other groups with long experience in the field of clothing and textile.

DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE

SOCIAL SECURITY ADMINISTRATION

EMERGENCY FINANCIAL ASSISTANCE AND EMERGENCY CLOTHING—SOCIAL SECURITY ADMINISTRATION—STATE AGENCY AGREEMENT

The Department of Health, Education, and Welfare, acting through the Social Security Administration, in order to carry out responsibilities delegated to the Secretary of Health, Education, and Welfare by the Federal Civil Defense Administration, hereby designates the_____of the
(Public Assistance Agency)
State of_____as the agency within said State to plan for and, following the proclamation of a state of civil defense emergency by the President or by concurrent resolution of the Congress, to administer the programs of emergency financial assistance and of emergency clothing under Federal Civil Defense Delegation No. 1 (19 F. R. 4546, July 22, 1954).

The_____of the State of_____
(Public Assistance Agency)
hereby accepts this designation and agrees to carry out these programs in accordance with instructions issued by the Social Security Administration and within standards and in accordance with the procedures promulgated and prescribed by the Social Security Administration.

In accordance with such policies and provisions as the Federal Government may make, the_____of the State of_____
(Public Assistance Agency)
will receive advances of funds or will be reimbursed for sums expended for emergency financial assistance or emergency clothing for civilians injured or in want as a result of attack.

With respect to all funds received in a civil defense emergency for the purposes specified above, the_____of the State of_____
(Public Assistance Agency)
further agrees to maintain records of its acts and disbursements, which will be available for Federal audit or other inspection.

The effective date of this agreement will be the date it is signed by the Commissioner of Social Security.

Date_____

_____
(Name of State Agency)

By_____
Commissioner or Director.

Concurred_____
(Date)

_____
Director, State Civil Defense Administration.

Date_____

SOCIAL SECURITY ADMINISTRATION,

By_____
Commissioner.

Mr. ROBACK. May we have a point of clarification here? With regard to the participation of the States, do they participate with you in developing these plans in any sense?

Mr. MITCHELL. Yes.

Mr. ROBACK. Do they in the development of those plans get half of their administrative expenses reimbursed?

Mr. MITCHELL. No, sir; they do not get any of their administrative expenses reimbursed.

Mr. ROBACK. You made a previous statement that under your program the State gets half of the administrative expenses. Does that exclude any money spent for planning on civil defense?

Mr. MITCHELL. That money can only be expended in administration for carrying out purposes of the Social Security Act. It does not include civil defense planning by State welfare departments.

Mr. ROBACK. So the States get no reimbursement for administrative planning on civil defense?

Mr. MITCHELL. That is correct.

Mr. HOLIFIELD. From your Department?

Mr. MITCHELL. From our Department.

Mr. ROBACK. The reason I asked the question is that under the Federal Civil Defense Act as I understand it, the States cannot get any assistance for administrative expenses. They get it in the form of grants for equipment. If they were getting administrative expenses under this program, it would be in a sense an evasion of the requirements under the act. I wanted to explore it for a moment.

Mr. MITCHELL. Some of the States have State-appropriated funds for this purpose.

Mr. HOLIFIELD. Yes.

Mr. MITCHELL. Working relations have been established with certain private social agencies and professional organizations who will be involved in the program and with key people in the clothing industry, the National Retail Dry Goods Association, etc., who are assisting in the establishment of an advisory committee on clothing to aid in planning for that project.

Fiscal and organizational materials for guidance and help of the State agencies including the fiscal and reporting forms that would be necessary in any planning involving the expenditure of large sums of public money have been developed.

Mr. ROBACK. Can we get an explanation of the States acting as the agents referred to here? If the Federal Government is supplying the funds, presumably the States are committing themselves to carrying out what the Federal Government directs them to do.

Mr. MITCHELL. That is right.

Mr. ECKHART. That is clarified in this agreement with the States.

Mr. HOLIFIELD. Does this envision the problem you might say of requisitioning clothing from the retail and wholesale establishment and supplying them to needy civilians?

Mr. MITCHELL. Yes.

Mr. HOLIFIELD. And the proper planning of reporting forms that would enable the owners of that clothing to receive reimbursement from the Federal Government?

Mr. MITCHELL. Well, I would like to answer that question by explaining briefly the process as we envision it at this particular time.

We would probably—I guess rather definitely—use the procurement facilities of the FCDA itself for the actual procurement of the clothing.

And also the traffic department or whatever that might be called of FCDA for the actual transporting of the clothing in bulk to the city of its need.

Thereafter, however, the welfare department would be responsible for determining need, getting in the requisitions and distribution to the individuals who needed it.

Mr. HOLIFIELD. Those requisition forms are not printed and in being in the different States of the Nation, are they?

Mr. MITCHELL. They are all here at the present moment. They are just in draft form.

Mr. HOLIFIELD. Draft form?

Mr. MITCHELL. Yes, sir.

Mr. HOLIFIELD. So we can assume that the owners of clothing in the retail and wholesale and manufacturing field are as yet unapprised and unaware of this program.

Mr. MITCHELL. They are apprised to this extent. We had one meeting with representatives of the clothing industry, which was primarily one of defining our problem and getting their assistance to test its validity and also to give them a first preliminary warning as to what the clothing industry might be up against in this total picture.

Mr. HOLIFIELD. Of course, this is an important field, if it is going to be worked out, because in this instance the Government is stepping in and requisitioning private property.

Mr. MITCHELL. Yes, sir.

Mr. HOLIFIELD. With the promise of payment.

Mr. MITCHELL. Quite.

Mr. HOLIFIELD. Unless you have a pretty well worked out foolproof plan in this field and a plan which has been well publicized to the owners of this property, you are going to find great reluctance on the part of a man who has, let us say, a hundred thousand dollars' worth of clothing in his shelves of having that clothing carried out of his establishment and receiving a piece of paper signed by some local official saying that they will pay for it some day, maybe.

Mr. MITCHELL. I must say that in this one meeting with a relatively small group of representative clothing people their reaction to the proposal was one of very fine cooperation.

Mr. HOLIFIELD. I would assume that that would be their attitude providing the details were worked out in such a way that they would not jeopardize their property rights.

Mr. MITCHELL. Quite. But I would like to state again: You can understand that if these requisition forms are loosely held or loosely distributed and not correctly signed that there would be a pretty confusing factor in the program.

I would like to restate, however, that as we envision our responsibility at this time, we would not be dealing directly ourselves with the suppliers of clothing.

Mr. HOLIFIELD. That is right.

Mr. MITCHELL. That would be FCDA procurement.

Mr. HOLIFIELD. But you are drafting the plans and the forms which you hope will be used on the State level.

Mr. MITCHELL. Yes, sir.

Mr. HOLIFIELD. And it will be up to the State then to assume the responsibility of using those plans and those forms.

Mr. MITCHELL. Yes, sir. But they in turn as they needed clothing could requisition them through the FCDA organization.

Mr. HOLIFIELD. All right. Then that comes back to a Federal responsibility for payment.

Mr. MITCHELL. Yes, sir.

Mr. HOLIFIELD. Of these bills in case they occur. That again as I say involves a very clear understanding on the part of Federal Government in assuming the liability and also a readiness on the part of the people to recognize that there is a firm understanding and a firm procedure before they will honor these requisition slips.

Mr. MITCHELL. I agree to that.

Mr. HOLIFIELD. That doesn't exist at the present time.

Mr. MITCHELL. No, sir.

Mr. HOLIFIELD. I am not condemning you for planning it, you understand, I am trying to find out where we stand on it. I am glad you are planning it.

All right, proceed.

Mr. MITCHELL. The amount allocated for fiscal 1956 for work on these delegations was less than had been anticipated in the proposed work plan and budget and it has not been possible to recruit the full field staff to work with the States that we had anticipated. Four regional staff members, however, are on the job in these four regions and working with the States to set up their organizational and program plans.

Mr. HOLIFIELD. Do you know how many States have been contacted?

Mr. MITCHELL. Every State has been contacted in the narrow sense of that term. They know about it. We have discussed it with them on several occasions. We had a series of regional meetings with all the State administrators or their representatives. Then only last week in conjunction with other business we had all the State administrators of public welfare into Washington and advised them of the latest developments in the civil-defense area and also undertook to seek their cooperation when we approached them in the relatively near future in the mater of signing these agreements of cooperation with the Federal Government.

Mr. LIPSCOMB. What are the four regions in which these staff members are working at the present time?

Mr. MITCHELL. I believe they are centered in New York, San Francisco, Chicago, and Atlanta.

There are four. One was very recently provided for. Our plan is to establish these representatives in each of our nine regional offices. Those are the nine regional offices of the Department for its regular statutory responsibility.

Mr. HOLIFIELD. This is what you are spending the $135,000 for?

Mr. MITCHELL. Yes, sir. The increases asked for 1957 are designed to permit the staffing of the other regional offices not presently staffed.

State welfare agencies have many responsibilities in peacetime in addition to those in which the Federal Government participates and likewise in defense planning they have responsibilities beyond those of this delegation.

Work done under the delegation must be closely coordinated with other responsibilities and as a matter of fact will pretty much serve as the basis for the broader program.

This is in very broad outline how we are proceeding and what we have done up to the present. The programs we have been assigned are not different in content and general administrative character to the programs with which we work with the State welfare department in our continuing peacetime relationships.

The differences lie in the almost overwhelming size of the disaster assumed, the needs that would have to be met and in the circumstances of destruction and horror under which they would have to be met.

It is our belief that this program demands of us careful and realistic planning, clear identification of responsibility and the persons who would discharge that responsibility in each and every section of the country and acceptance by all of us that the skill and effectiveness with which we meet such responsibilites would spell the measure of survival of the millions for whose need in such an emergency we plan.

Mr. HOLIFIELD. Thank you, Mr. Mitchell. We can all certainly agree with the latter part of your statement there. We hope that your planning to date as evidenced in this memorandum of understanding and the draft of the contract with the States has been carefully and realistically planned.

Of course, the test of it will be in how many of the States will accept it and put it into effect and how quickly.

The clear idea of the responsibilities in every field is another thing that of course I referred to when I talked of the financial responsibility for payment for private property which might be used under the clothing part of the agreement.

Mr. MITCHELL. I feel I should say, Mr. Chairman, that the success that we may experience in this effort I think will depend to a large extent of certain assurances that might ultimately be given to the States in discharging their financial responsibilities which is the question that the gentleman raised just a few minutes ago.

In our discussions with the States they have consistently and frequently brought up the matter of compensation for expenditures in this field since they regard the whole thing as a national problem rather than a State problem. Only two States in the Union have done very much in the welfare field of civil-defense planning and those are States that obviously would be in the forefront of any very profound concern in time of crisis; that is New York and California.

They have spent substantial sums over the past 2 or 3 years. But in all of the other States of the Union, the welfare planning in the area of financial assistance and clothing has been either nonexistent or sort of sporadic and desultory.

I have talked personally I would say at one time or another with 30 State welfare administrators and one of the first questions they always raise is are we going to get any administrative money for this, because their explorations in their own States have revealed that the State legislatures are not very sympathetic.

Mr. HOLIFIELD. As a matter of fact, as far as your knowledge is concerned, most of the State officials look upon an enemy attack as a national attack and not as an attack upon their cities and their States as different political entities; is that not right?

Mr. MITCHELL. Yes, sir.

Mr. HOLIFIELD. In your experience in dealing with these State officials have you not found in most instances their belief that the financial burden should be borne by the Nation rather than the individual city that might be hapless enough to be attacked?

Mr. MITCHELL. Yes, sir. They likewise feel that as a practical proposition regardless of the philosophy back of it if the Federal Government is going to effectuate a national plan in this area, the Federal Government is going to have to pay for it, because of the apathy or the feeling that they have interpreted as being within the

State, that their legislatures are not inclined to make appropriations for this purpose.

Mr. HOLIFIELD. And then following up that line of thought to its logical conclusion, you would be forced to state that the 1950 Civil Defense Act is obsolete as far as its practicability is concerned in the fact that it does not assume Federal financial responsibility for this overburdening amount of financial help that would be necessary in the case of an enemy attack?

Mr. MITCHELL. As I understand it, Mr. Chairman, there is no statutory in the Federal Civil Defense Act to pay for this type of activity, and there are no appropriations for this purpose.

Mr. HOLIFIELD. To pay for what type of operation?

Mr. MITCHELL. For the administrative expense of the implementation of this program in the States.

FURTHER STATEMENT OF DEAN SNYDER, DEFENSE COORDINATOR, OFFICE OF ASSISTANT SECRETARY OF HEALTH, EDUCATION, AND WELFARE FOR FEDERAL-STATE RELATIONS

Mr. SNYDER. After the emergency in certain cases, but not before the emergency.

Mr. ROBACK. A number of governors have said in their communications that the act bars this payment——

Mr. MITCHELL. That is correct, before the emergency.

Mr. HOLIFIELD. Mr. Snyder, will you please correct that for the record.

Mr. SNYDER. The act after the imposition of title 3 responsibilities, permits the Federal Government to assume some of the responsibility. It is in the preemergency period, the planning period, where the act prohibits payment to the States although it permit articles of civil defense equipment to go to the States.

Mr. HOLIFIELD. On a surplus basis.

Mr. SNYDER. In part, yes.

Mr. HOLIFIELD. And on a contribution basis in the way of medicines and things like that, which can be bought by the FCDA within their appropriations.

Mr. SNYDER. The problem of administrative expenses arises in virtually all of the units of the Department. It is particularly acute for the State welfare departments, but it is also true for the health departments and we might say also in the food and drug area, and in the education area.

Although the States in a few cases have been willing to provide some administrative money for this purpose, by and large they have not and as Mr. Mitchell says if we are to do an effective job of Federal-State planning with them in this very vital area of preemergency planning they would look to us for help under the assumption that it is a national situation for which we are planning.

Mr. ROBACK. Does the Department favor that kind of an amendment to the law?

Mr. SNYDER. We have never approached that as a departmental policy. That has never been put to us in quite those terms. But there is evidence I think that in the report of the Kestnbaum Committee of which our present Secretary was a member that that recom-

mendation was strongly made. I can only assume in advance of any actual question raised with us, that certainly from the operating official's point of view, and from the testimony of the State officials with whom we work as counterparts, there would be every indication that our feeling would be in support of the Kestnbaum Committee's report.

Mr. HOLIFIELD. In other words, as a matter of practicality unless there is a revision of this attitude on the part of the Federal Government, there will be no practical cooperation on most of the State levels.

Mr. SNYDER. I think there is always a measure of cooperation and it is a pretty strong measure on the basis of relationships that exist and have existed over many years.

We know these people through day to day relations.

Mr. HOLIFIELD. I am not speaking of their willingness to cooperate, but I am speaking of their ability as they determine it from a financial standpoint.

Mr. SNYDER. Up to a point, but beyond that point in actual operations and particularly in State training programs—which would be so necessary both at the State level and in the localities—I think you would run into a complete block. I doubt if appropriations under the delegations would be available or could be legally spent for this purpose on a training basis except in 1 or 2 States where they have a State law specifically on civil defense.

Mr. MITCHELL. I will be very surprised if we don't get agreements signed by every State but thereafter in the implementation of the agreement, then it will range from zero to a full-fledged sort of cooperation in States severely threatened like New York and California.

Mr. ROBACK. I would like to request, Mr. Chairman, a brief statement from the Department setting forth the problem in this area and if possible what would be a legislative requirement if such a policy were to be put into effect.

Mr. HOLIFIELD. Could we obtain that from you, Mr. Snyder?

Mr. SNYDER. I will try to provide it.

(The following supplementary statement was subsequently submitted for the record:)

From the standpoint of this Department as a delegate agency, civil defense expenses may be broken down into two categories:

1. Those expenses incurred prior to attack, largely involving administrative planning of programs to operate during the postattack or emergency period.

2. Those which would be incurred subsequent to attack or to the proclamation of a civil-defense emergency as specified in section 301 of the Federal Civil Defense Act of 1950, Public Law 920, 81st Congress, 2d session.

During prior testimony, considerable interest was shown in the problem generated by the reluctance and/or inability of State governments to assume the cost of administrative and personnel expenses incident civil-defense planning under the delegated programs. This is a matter which was thoroughly explored during the testimony. Accordingly, further discussion would not seem necessary at this point.

The problem arises from the language of the Federal Civil Defense Act. Subsection (i) of section 201 of the act provides that: "* * * except as otherwise provided in section 303 (d) of this act, *no contributions shall be made for State or local personnel and administrative expenses*, or for items of personal equipment for State or local workers, or for the procurement of land * * *." [Italic supplied.]

Subsection (d) of section 303 permits the Administrator of the Federal Civil Defense Administration to "reimburse any State, including any political sub-

divisions thereof, for the compensation paid to and the transportation, subsistence, and maintenance expenses of any employees while engaged in rendering civil defense aid *outside the State* and to pay fair and reasonable compensation for the materials of the State government or any political subdivision utilized or consumed *outside the State*, including any transportation costs, in accordance with rules and regulations prescribed by the Administrator * * *." [Italic supplied.]

The act is thus seen to prohibit, clearly and unequivocally, Federal assistance for State personnel or administrative expenses without regard to the time at which the obligation is incurred, except for those specified expenses contracted in connection with assistance rendered beyond State boundaries during the period of an emergency.

In order to make Federal assistance available generally to the States for administrative and personnel expenses, subsection (i) of section 201 would have to be repealed in whole or in part and subsection (d) of section 303 would require modification.

Mr. HOLIFIELD. Mr. Eckhart has some questions he wants to propound at this time.

Mr. ECKHART. A few of these areas have been covered but they deserve some elaboration. You have not indicated the extent of financial responsibility on the part of the Federal Government in connection with the emergency clothing program. Could you put that in the record for us?

Mr. MITCHELL. One hundred percent. That was one of the things we undertook to clarify after the original delegation with FCDA, to what extent was the Federal Government committing itself to reimburse the States for any expenditures made under the delegations for other than administrative expense in planning. The ultimate response, the signed agreement between the two agencies, the Department, and FCDA, made it very clear that the Federal Government is obligating itself for 100 percent of disbursements made under these delegations.

Mr. ECKHART. What provisions are made for a Federal postaudit of these expenditures, just in brief terms?

Mr. MITCHELL. We have only given that a passing consideration up to now. But that is part of our regular job in our regular statutory activities. We make grants to the States that run in excess of $1¼ billion a year now. We audit those grants and we would presume to extend that audit to include this—although I would think it would have to be a much more superficial type of audit than is presently made.

Mr. HOLIFIELD. That is extended under existing law under the OASI program?

Mr. MITCHELL. No, under the public-assistance program.

Mr. HOLIFIELD. Public-assistance program?

Mr. MITCHELL. Yes, sir.

Mr. HOLIFIELD. Is it your thought that that will be extended now to the broad category of people in need in case of military disaster?

Mr. MITCHELL. We will use the same organizational mechanism for the civil-defense program as we do for our regular programs. And that mechanism includes an auditing arrangement. I am just saying that as we proceed to develop our emergency plans in greater detail, it would seem to me that we could not hold the States to as detailed an accounting for every dollar that is spent under this emergency during time of crisis that we do in the course of their normal day-to-day peacetime operations.

Mr. ECKHART. You have two primary responsibilities, that for the emergency clothing program and that for emergency financial assist-

ance. With respect to the first, what problems do you expect the local people to encounter in working with the merchants and the warehousemen, and the owners of clothing stocks?

Mr. MITCHELL. I don't expect the local people to be contacting those people at all.

Maybe that is too inclusive a statement, but as I would envision the operation of this—and I hope that the staff will pick up if I am not completely accurate on this. They would undertake to identify the extent of need and then would requisition through established and agreed upon channels for that amount.

Mr. ECKHART. But in terms of planning, are you able to determine the clothing stocks and the levels of the stocks that exist in the type of clothing that you would be distributing during an emergency?

Mr. MITCHELL. We will have an interest in that, as I see it, but not a responsibility for it. The outfit that has the responsibility for acquisition, for procurement, will be the organization responsible for determining what clothing is available and where it is located.

Mr. HOLIFIELD. The State organization, State-county, or city.

Mr. MITCHELL. That might be possible, but I would expect that the procurement department of FCDA would accept overall national reponsibility in that field.

Mr. ECKHART. I am thinking in terms of the national resistance of people in the competitive clothing business to make known to people for planning purposes the stocks of clothing that they normally keep.

Do you expect to run into difficulties in that area?

Mr. MITCHELL. I am sorry, I can't answer that question. It would be just a personal opinion and a rather uninformed one.

Mr. ECKHART. Could Miss Engle respond?

Miss ENGLE. That is something on which we would have no experience. It would be up to the people developing the supply function.

Mr. ECKHART. With respect to the financial assistance emergency program, what is the value of money going to be in the event of a serious emergency in a large metropolitan area?

Mr. MITCHELL. It is entirely possible and probable that we would go off a cash economy for varying periods of time. But that is another thing we undertook to clarify in this agreement with FCDA. We will be able to give orders for supplies, just as we will be able to make cash grants if we are still functioning under a cash economy.

Mr. ROBACK. Do you contemplate the use of some other temporary medium of exchange, script in the form of orders?

Mr. MITCHELL. In the form of orders, yes. We were not thinking in terms of negotiable script.

Mr. ROBACK. In this planning for cash assistance, do you have included any kind of discussion with the people who are responsible for the actual production of currency?

Mr. MITCHELL. It has not gotten into that yet; no, sir.

Mr. ROBACK. Do you have any intention of carrying it to that level or is there an assumption that cash will be available?

Mr. MITCHELL. I don't think our planning thus far has taken that into account.

Mr. HOLIFIELD. Your utilization of cash assistance would be actually not confined to currency. It would include requisitions, responsible requisitions.

Mr. MITCHELL. It would be cash or orders.

Mr. HOLIFIELD. Warrants, you might say?

Mr. MITCHELL. That's right.

Mr. HOLIFIELD. Properly signed documents.

Mr. MITCHELL. Yes, sir.

Mr. HOLIFIELD. You include that in your cash assistance understanding?

Mr. MITCHELL. That's right.

Mr. ECKHART. Within this interim agreement, the memorandum from Mr. Roney of the Bureau of Public Assistance to yourself, there is a statement made that—

> the staff of the FCDA Welfare Office have reviewed the interim statement and gave general approval to sections 1, 2, and 3. They expressed regret, however, that the definition of services was limited to those related to the giving of emergency financial assistance. They had hoped that the definition might include more specialized services related to the rehabilitative process.

Who has any responsibility for rehabilitation if the Bureau of Public Assistance does not interpret that to be one of their responsibilities under the delegation?

Mr. MITCHELL. As I understand it, any responsibilities in this field that have not been delegated still rest in the hands of FCDA for them to administer themselves or to administer through others as they ultimately determine.

I think then it must be said here, again for the purpose of clarity, that to take cash assistance and clothing out of the composite of all welfare needs that will arise in this general area of dealing with people in a time of crisis poses many problems for all of us.

In my personal judgment—and I have had some experience, but I am not expert by any means—it seems to me that public agencies must be relied upon for doing this total job of mass care.

Mr. HOLIFIELD. Food, clothing, medical attention, shelter, the whole thing.

Mr. MITCHELL. Yes, sir; after all, I testified that 80,000 people are working full time in this field. They constitute our skill and experience and staff that will immediately have to be brought to bear on this type of problem in time of crisis. Just how it will be worked out if one agency handles cash and clothing and another one handles feeding and shelter and so on, poses for me very substantial problems, but hopefully we may have a long time to plan these things and coordinate and cooperate and——

Mr. ROBACK. Is it conceivable that the FCDA insofar as it retained responsibility for some of these care functions would have to deal with the same agencies that you would be dealing with in your State relationships?

Mr. MITCHELL. That is my personal opinion and I think it is an informed opinion. Yes, sir.

Mr. ROBACK. Do you understand that the authority of the FCDA Administrator supersedes any authority you have for dealing with State agencies under emergency conditions?

Mr. MITCHELL. I don't know about that.

Mr. ROBACK. I would like if you can't answer that question to get a legal opinion from your counsel at this point for the record.

Mr. HOLIFIELD. Will you furnish us that?

Mr. MITCHELL. I really feel that that opinion should be furnished by FCDA rather than us because we are just one of the several departments involved.

Mr. ROBACK. I am not asking you as to the authority of the Administrator. I am asking you as to whether you think your authority is superseded by that of the Administrator. I am asking you for an interpretation of the law under which you operate in relation to that of the Administrator.

Mr. MITCHELL. We would not stop with any interpretation we made as an operating proposition. We would come up with that and then consult with FCDA if we were right. I think that on the whole we would accept FCDA's judgment since they are the agency charged with the responsibilities of the administration of the FCDA law.

Mr. ROBACK. This question is directed to the possibilities that the FCDA would be dealing with the same local agencies as you, and the possibility of a conflict is not inconceivable. You have certain statutory and established relationships with the local agencies. In case of a conflict which might be due to a difference of interpretation of the respective laws under which you both operate, who would prevail?

That is a legal question in part and I was just asking for a legal opinion.

Mr. HOLIFIELD. Will you consult your general counsel and have him direct a letter to us on that point, if you will, Mr. Mitchell?

(The document is as follows:)

STATEMENT SUBMITTED FOR THE RECORD IN RESPONSE TO REQUEST BY CHAIRMAN HOLIFIELD

During testimony before the Subcommittee on Military Operations of the Committee on Government Operations, Mr. William L. Mitchell, Deputy Commissioner, Social Security Administration, was asked by Chairman Chet Holifield for a legal opinion on the question of whether "the authority of the FCDA Administrator supersedes any authority you have for dealing with State agencies under emergency conditions?" (Hearings, March 23, 1956, p. 1852.) The question was further explained as being "directed to the possibilities that the FCDA would be dealing with the same local agencies as you, and the possibility of a conflict is not inconceivable. You have certain statutory and established relationships with the local agencies. In case of a conflict which might be due to a difference of interpretation of the respective laws under which you both operate, who would prevail?" (P. 1853.)

The authority of the Department of Health, Education, and Welfare to deal with the States in the administration of the Federal civil-defense program is based exclusively upon Federal Civil Defense Delegation No. 1, approved July 14, 1954 (19 F. R. 4546). If for any reason, the Administrator of Federal Civil Defense should feel it desirable to dispense with the services of this Department, a withdrawal of the delegation would accomplish the purpose. Thus, no conflict between the two agencies would appear possible with respect to the delegated civil-defense program.

There is no specific independent authority vested in the Department of Health, Education, and Welfare which relates to dealing with the States under emergency conditions. The authority of the Department and its constituent unit, the Social Security Administration, to deal with the States in the administration of the various long-established assistance programs derives from the provisions of the Social Security Act, as amended. The act, in brief, provides for grants to be made to the States under varying formulas contingent upon submittal of a plan which meets certain statutory conditions. The act requires that the Secretary "shall approve any plan" which satisfies the specified conditions. Where for one reason or another a State decides against further participation in a categorical program or is unable to qualify for further Federal contributions, payments may no longer be made to the particular State for a particular program.

Such inbility on the part of a State to qualify for Federal payments might stem, of course, from a decision to devote its resources and personnel to other

programs or to other purposes. For example, during a civil-defense emergency it is conceivable that a State might determine that civil-defense programs should be accorded a certain priority as against the assistance programs defined in the Social Security Act. This could lead to a suspension of operation of social-security programs as they are now constituted; but it is only in this restricted sense that conflict between FCDA and the DHEW seems possible in their respective working relationships with the States. Moreover, such termination or suspension would result, it appears, not because of a conflict in the true sense of the word and not from any superseding authority of the Federal Civil Defense Administrator, vis-a-vis the authority of the Secretary of HEW, but because of the overwhelming necessities of an emergency period forcing the withdrawal of a State from participation in one program in order to assume its role in another designed to operate during particular exigencies.

Mr. ECKHART. This is in conection with the planning assumptions, I understand that they have been adopted from the current planning assumptions prepared by FCDA for the period July 1, 1955, to June 30, 1956.

I further understand that these are the same planning assumptions that are made available to anyone who would request them, of course, to all agencies working under the delegation responsibilities. Would it be helpful if FCDA could supply you people with planning assumptions which would be directed to your particular field of activity?

Mr. MITCHELL. I would think so, although we have not been hesitant at all to request any information of that nature that we feel would be helpful to us from FCDA.

Mr. ECKHART. You take a rather negative approach to this planning. I am reading from the interim statement now on page 5:

> In planning for civil defense we are working in a highly speculative field because we do not know the size and combination of weapons that might be used or where and when the attack might occur. We cannot fully anticipate or assess the damage that an attack with nuclear weapons might accomplish or the magnitude of the job that would face us.

This is just the Bureau of Public Assistance talking here.

I am wondering if you can get some more specific planning assumptions directed to the public assistance responsibilities from FCDA, if that would be helpful in carrying out of your mission.

Mr. MITCHELL. I would say "Yes," because the best information we can get is that which will help us most in fitting our organizational and other plans to meet the ultimate requirements, but frankly, it seems to me that as time goes on, processes of anticipating need in making these assumptions are going to be refined and improved. As of any given point of time, one assumption may be as good as another to plan on, because it is going to be a kind of "guesstimate" proposition in any case. I do think—I presume this is being done—that any assumptions that we are given are those that are given to all of the other agencies functioning under the delegation so that we are all talking out of the same book.

Mr. ECKHART. Then the same statement on page 7 "Clothing contaminated by radioactive fallout will have to be replaced." I would envision this would be replaced at the distribution center for the new clothing. Do you have any plan for let us say the destruction or the removal of contaminated clothing under those circumstances?

Mr. MITCHELL. No, we don't; and we would certainly look to the scientific agencies to accept responsibility for that. I understand that that is a very difficult scientific problem—disposal of radioactive material.

Mr. HOLIFIELD. Have we had testimony from Dr. Scheele that there were no special decontamination rooms available in any of the hospitals for this sort of thing?

Mr. MITCHELL. I was talking to a scientist just the other day who said the whole organized field of scientists were considering the implications of attempting to dispose of this waste at the bottom of the ocean. But then they were concerned about what that might do to the ultimate food supply since scientifically it is projected that a great proportion of our food supply in the future is supposed to come from the depths of the ocean.

Mr. ECKHART. In connection with the time scale since the FCDA delegated responsibilities to HEW, you received your delegation on July 14, 1954.

Mr. MITCHELL. I believe it was August.

Mr. ECKHART. My paper shows July 14 and on January 5, 1956, the memorandum of understanding between HEW and FCDA was actually executed. The last signature was in December 1955, that is a time phase there of almost a year and a half and it was not until March 7, 1956, that your interim statement on emergency clothing and emergency financial assistance programs were formulated.

This is to be followed I understand with a manual some time later this year. I am wondering whether or not this loss in time here represents the inability to do this faster because of the paucity of funds or unavailability of funds.

Mr. MITCHELL. No. I would say that the funds that we have received have been sufficient. You see when the delegation was first made we started from absolute scratch. We had no employees devoted to this, we had no expert knowledge of the problems that we would be confronted with. As I recall it, for the first 5 or 6 months we employed as a welfare consultant a man from New York named Alden Bevier, who had had several years of experience in this field, and who had been doing this work in New York State, to analyze the scope of the problem we were confronted with.

Mr. ECKHART. It was not for financial considerations?

Mr. MITCHELL. No, sir.

Mr. ECKHART. In connection with Delegation Bulletin No. 2 of January 16, 1956, on requiring quarterly progress reports by the Federal agencies, do you have any views on the requirement imposed upon you under this reporting system?

Mr. MITCHELL. I don't have any views. I would like to request Miss Engle to react to that.

Miss ENGLE. It is an overall requirement on the Department. I think we find that perhaps our usual procedure of reporting which is fairly well established then has to play into a form, a new form which is something that the Department would have to work out.

Mr. SNYDER. Mr. Chairman, if I could, I might supplement that. The FCDA office has been very sympathetic with us in realizing that our normal procedure within the Department is based upon careful reporting. That is what Miss Engle is referring to as a part of their normal work. Although I am not in the Social Security Administration, I can state that they do a very good job of work planning. They make their advance plans on a 6 months' period and report against those plans.

Mr. ECKHART. What reporting requirement has FCDA imposed upon HEW prior to January 15, 1956.

Mr. SNYDER. The reporting requirements were somewhat informal prior to this latest bulletin but, nevertheless, they were well aware of, and were kept well aware by our operating people, as to what we were doing under the delegation. Prior to this bulletin, the reporting procedure was about as follows:

We had regularly scheduled conferences with the FCDA representative from Battle Creek who deals primarily with the delegations program. These included staff reporting back and forth and our submitting to FCDA significant program documents as they were prepared.

Mr. ECKHART. In connection with that Mr. Snyder, I note that all through these agreements and reports that there is reference made to staff coordination and staff approving. Do you feel that anything is bein sacrificed by allowing all of this coordination and coordination being accomplished at staff level rather than having some of them reduced to summary document and signed at the Department level?

Mr. SNYDER. We are doing both, Mr. Eckhart. It is natural that in these specialized fields, there would be very close, almost day to day staff development and coordination and exchange of views and documents at the professional or the technical level, but from the overall point of view as I was mentioning, our relationship has been very close, on the part of Assistant Secretary Mintner's office, with responsible officials at Battle Creek. The more formalized reporting procedure has now come to us. The Public Health Service, as we noted yesterday, has prepared rather comprehensive annual and quarterly reports which we supply to the Federal Civil Defense Administration as issued. They have been quite willing to accept from us that kind of reporting material supplemented recently by an overall summary for the Department in the form of a detailed letter and related documents. This represents at the present time our compliance with this initial FCDA bulletin.

So that from our point of view we have been in close and I hope full touch with FCDA in keeping them abreast of what we are doing.

There is one other means of reporting and coordination and a very important one. That comes at the time of the preparation of the budget for a new year. In the preparation of the 1957 budget we went through a series of policy discussions with the FCDA at which we took up with them project by project what our anticipations were and received from the full agreement on the particular schedule of activities which were developed.

Mr. ECKHART. In view of that do you believe that quartely reports of such an extensive nature is a good reporting system?

Mr. SNYDER. I think we owe it to the FCDA to provide them with report information. However, the formalization of those requirements may not result in providing them with as good information as though we proceeded in the other ways that I have described as being more suited to our regular operations.

Mr. ECKHART. I don't know whether the committee should attach any significance to this or not but it did catch my attention. "The first report should be prepared as soon as convenient but in time for any congressional hearing which may develop on the subject in Janu-

ary." Has there been any language similar to this in any previous requirement for reporting?

Mr. SNYDER. That is the first definite document on the reporting procedure that we have received.

Mr. HOLIFIELD. It seems to indicate that the FCDA anticipated some hearings on this matter the early part of 1956.

Mr. ECKHART. I have one further question, Mr. Chairman.

The Department of Labor has the delegation for determining the availability of personnel in all parts of the country. I wonder what degree of coordination is necessary between the Bureau of Public Assistance and the Department of Labor to determine which people the Department of Labor will consider as being essential for the performance of some particular findings which the Bureau of Public Assistance may already have delegated to one of the State assistance agencies?

Mr. MITCHELL. I don't see any particular problem there. Do you have a particular type of situation in mind that——

Mr. ECKHART. Clerical personnel could be employed in State welfare offices.

Mr. MITCHELL. Yes.

Mr. ECKHART. And they could possibly be used for distribution of clothing if you had a clothing line set up, whereas the Department of Labor may have made a survey of all clerical personnel, included those people and expected to reassign them to another function during the period of emergency.

Mr. MITCHELL. A determination of essentiality for service under crisis, whether you should serve one place or another?

Mr. ECKHART. Yes.

Mr. MITCHELL. We have not given that any consideration. I think, however, determination of essentiality in the past under crisis conditions had not gone to the dislocation of public service and I would presume that if they were employed in a high priority function such as the distribution of clothing or anything else under an FCDA order, that there would not be any priority higher than that that would require their dislocation.

Mr. ECKHART. Yes, sir, that is all I have, Mr. Chairman.

Mr. HOLIFIELD. Thank you very much, Mr. Mitchell and Miss Engle for your testimony.

Mr. Snyder, in view of the time and we have other obligations—Mr. Lipscomb and I—this afternoon, and in view of the time that it has taken for our presentation this morning, we would like to have the statements of Mr. Shelbey Grey, the Director, Division of Program Planning, Food and Drug Administration and Dr. John R. Ludington, chief of the civil defense education project placed in the record at this point and with the privilege of the staff studying them and possibly calling them back for additional questioning at some later time if the committee, full committee desires it.

I would like to have Mr. Grey come forward at this time if he will.

Mr. Grey, we will accept your statement as you have it prepared and submit it to the subcommittee at this time. I would like to ask you, however, a few questions just to determine certain essential facts.

How much money has been allowed you under your allocation of

funds to discharge the responsibilities delegated to you by the FCDA in 1956.

(The document referred to is as follows:)

STATEMENT OF SHELBEY T. GREY, DIRECTOR, DIVISION OF PROGRAM PLANNING, FOOD AND DRUG ADMINISTRATION, DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE

Mr. Chairman and members of the committee, my name is Shelbey T. Grey. I am Director of the Division of Program Planning, Food and Drug Administration, Department of Health, Education, and Welfare.

Through delegation No. 1 of the Federal Civil Defense Administration, the Food and Drug Administration has the following civil-defense responsibilities: "Plan a national program, conduct research, develop technical guidance for States, and direct Federal activities designed to meet the extraordinary needs for food and drug inspection and control in attacked areas."

Three programs have been undertaken under the delegation.

I. EFFECT OF ATOMIC EXPLOSIONS ON FOODS AND DRUGS

In the first program we have attempted to evaluate a variety of conditions under which foods and drugs could be found in relation to the explosion of nuclear weapons, and to determine the all-important question of their immediate use to survivors. These tests were conducted at the continental test site in Nevada with experimental devices, having yields of 20 to 30 kilotons. Generally, it is believed that the results and interpretations based on these tests would be qualitatively applicable also to thermonuclear bombs having capacities 1,000 times greater.

Effects varying in severity were achieved by making exposures in the "bull's eye" area; i. e., within one-quarter to one-half mile and extending outward to what may be considered fringe areas, 1 to 3 miles distant. Rational for exposure within the critical close-in areas is supported by a consideration of structural types in American cities. These are mostly of steel and reinforced concrete together with extensive basement and subbasement facilities. There is good reason to believe that stores of foods and drugs so situated, even with near total destruction of the buildings might be recoverable and serve as valuable islands of support. In the bull's-eye areas there is high radiation flux consisting of neutrons and gamma rays and destructive blast pressures. These effects may be expected to modify the potency of drugs, create toxic byproducts, destroy vitamins, cause rupture of packaging, and loss of sterility of hermetically sealed products, and last, but not least, produce induced radioactivity. All the above effects have been evaluated at graduated distances from ground zero, with greatest emphasis of testing on the most critical exposures.

Drugs

In the spring of 1953 the Food and Drug Administration conducted tests on 40 drugs. These were carefully selected to represent the antibiotics, such as penicillin; maintenance drugs, such as insulin; and a variety of others important in general therapeutics or in disaster conditions. At the time of these tests there were no structural facilities within the bull's-eye area suitable for exposure situation, hence the drugs were packed in boxes and lightly buried in soil to prevent physical displacement. By this means they were exposed to high blast overpressures and radiation flux. At graduated distances up to 1½ miles, additional exposures were made. Evaluation of the results were carried out at the test site and the Food and Drug laboratories in Washington. A whole gamut of tests were finally made extending over a period of 6 months following the exposure of the drugs. In brief summary, it may be said that drugs critically exposed fared very well. Except for initial radioactivity which might make the immediate use of some drugs subject to question, and a reduction in potency of insulin and vitamin B_{12}, it was determined that under disaster conditions all drugs would be serviceable. Because of the favorable findings on the drugs critically exposed there is no question that all drugs in fringe areas would also be safe for immediate use.

(The results of the drug tests have been published by the Federal Civil Defense Administration in the form of a technical report No. TR–11–1, March 1955, entitled "Effects of Nuclear Explosions Upon Drugs.")

Foods

With the experience gained from the drug tests, the Food and Drug Administration conducted a very elaborate program to test foods at the spring, 1955, series in Nevada. This was a joint effort of the food and packaging industry and the Government. The following were participants: the National Canners Association; the Association of Frozen Food Packers; the American Meat Institute; the United States Department of Agriculture, represented by the Meat Inspection Service, and the Agricultural Marketing Service. The entire effort was sponsored by the Federal Civil Defense Administration.

Based on an intensive survey of foods most frequently used in the American dietary, and foods used in the intermediate manufacture of finished products, categories eventually were defined as follows: (*a*) Staples, such as flour and sugar; (*b*) semiperishables, such as lard and butter, ham and bacon, apples, onions and potatoes; (*c*) fresh meats under usual commercial refrigerated conditions; (*d*) frozen foods under like conditions; (*e*) heat-processed foods in cans and glass, and (*f*) canned and bottled beverages, such as soft drinks.

The heat-processed foods encompassed approximately 60 kinds, including different sizes of pack and a variety of canning procedures. These ranged from soups and vegetables to baby food and beef stew. The Agricultural Marketing Service also carried out an extensive study on a number of closures including wood, paper, many kinds of plastics, cellophane, and aluminum wrap. The overall volume of this combined food exposure was about 15 tons, half of it being of the canned type.

Most of the work has been completed in testing the foods that were exposed. This includes evaluation of physical damage, taste, and odor changes induced radioactivity, nutritional changes, and toxicity. A part of the program involving the testing of certain foods over the life span of animals will extend beyond June 30, 1956. A preliminary report of the food test program has been submitted to the Atomic Energy Commission. A declassified version is now in the process of publication.

It may be concluded that foods exposed critically in the "bull's eye" area could be made available under so-called "disaster standards" if recovered physically intact. In fringe areas where radioactivity would be ruled out, there would be no question that immediate use could be made of all physically intact foods.

For fiscal year 1957 it is proposed that a followup of the field tests conducted in Nevada be carried out. This is essentially a laboratory approach in which a number of the positive findings are reexamined under more precise conditions. It involves the placing of samples in an atomic pile, where it would be possible to control the radiation.

THE EFFECT OF BIOLOGICAL WARFARE ON FOOD AND DRUGS

In the second program, our Division of Microbiology has carried forward a planned program designed to determine the vulnerability of packaged foods and drugs to overt and to convert biological attack and to develop simple procedures for decontamination of such foods and drugs as may be critically needed following any enemy action.

Overt biological attack, while directed primarily against personnel, would secondarily result in contamination of food supplies. In order to properly assess the hazards involved, studies have been conducted in cooperation with another Government Agency to determine the extent of penetration of bacterial agents into foods in wholesale containers exposed to moderate aerosols. These experiments are essentially completed and reports are being prepared.

Through work with the same Agency, it has been determined that an insulated truck body, of a type readily available, constitutes a suitable chamber for effective gaseous decontamination of small lots of critical food and drug items. Materials necessary for use in this decontamination are likewise readily available and procedures for their application can be carried out without extensive training. Reports of these investigations have been prepared and are being cleared for publication.

At the request of the Food and Drug Administration, the National Academy of Sciences—National Research Council appointed a Food Advisory Committee to properly evaluate the problems associated with the vulnerability of food supplies to overt and covert chemical, biological, and radiological attack. This committee was composed of outstanding technologists of representative food industries and authorities from universities and research organizations. This

committee has completed its studies and has submitted an extensive report entitled "The Vulnerability of the Food Industries to Chemical, Biological, and Radiological Warfare Agents." In the report the committee emphasizes the vlunerability of food supplies in many stages of their preparation and urges that their recommendations be implemented. To carry out a portion of these recommendations, plans have been drawn to study the oral infectivity of potential biological warfare agents. Information in this field is presently inadequate or entirely lacking. These investigations will require installation of equipment adequate to prevent infection of workers in these areas or contamination of surrounding areas.

Other planned studies entail: (1) Determination of the longevity of these biological agents in various frozen or dried foods held under usual storage conditions; and (2) vulnerability and means of decontamination of foods and drugs in retail containers.

The work program anticipated for 1957 involves continuation of the 1956 studies on vulnerability and decontamination, with expansion to undertake an evaluation of the oral infectivity of pathogenic agents and thus determine their potential for use in covert attack through the Nation's foods and drug supplies.

III. CIVIL DEFENSE TRAINING PROGRAM FOR FOOD AND DRUG OFFICIALS

The third program is our training program. The purpose is to give a practical, down-to-earth course dealing with the problems that would confront State and local food and drug officials should our country be attacked with nuclear, biological, or chemical weapons. The latest available technical information for dealing with such weapon problems in order to protect, preserve, and salvage food and drug stocks, is given in the training program. In order to present this training program, the Food and Drug Administration organized and trained two instruction teams. Each team consists of two men who, in addition to a background of training and experience in food and drug work, have received special training and instruction in the technical aspects of atomic, biological, and chemical warfare and the problems in the food and drug field associated therewith.

Courses in approximately 50 cities have been scheduled during the current fiscal year and at the present time such courses have actually been held in 41 cities located in every part of the country. Approximately 1,400 persons have attended these courses. These have been largely State and local officials having food and drug responsibilities, members of other State and local organizations, and a limited number of persons from the food and drug industry, and other Federal agencies. By the close of the fiscal year the original schedule of training courses in 50 cities located in 46 States will have been completed.

Each training course consists of 1 week of instruction given by means of lectures, films, slides, and demonstrations. The subject matter given in the course deals with the nature of atomic, biological, and chemical warfare weapons, methods of measuring and evaluating radioactive contamination, methods of decontaminating foods, drugs, and facilities contaminated with 1 of the 3 warfare agents and instructions in the care, calibration, and use of instruments for measuring radioactivity.

A handbook of 188 pages entitled "Civil Defense Information for Food and Drug Officials" was developed and published to serve as a reference manual in connection with the training program. Divided into three parts, the book deals first with postattack problems and operations; second, with the nature of radioactivity, the biological effects of radiation, chemical warfare agents, and fundamentals of biological warfare; and third, with those principles of mathematics and chemistry that are necessary for a better understanding of the foregoing subjects.

In addition to the manuals needed directly for use in the training classes, between four and five thousand copies have been distributed in response to requests from Government organizations at the Federal, State, and city levels, schools, colleges, and public libraries, and from private industry. One reprinting of the manual has already been made and it appears that another may be necessary before the close of the fiscal year, if requests continue to be received at the present rate.

During fiscal year 1957, it is planned that two teams of instructors will continue to operate at about the same level as during 1956. Emphasis will be placed on assisting State food and drug officials in conducting State-sponsored courses. The handbook will be revised and expanded. The other instructional material will be revised and brought up to date.

STATEMENT OF SHELBEY T. GREY, DIRECTOR, DIVISION OF PROGRAM PLANNING, FOOD AND DRUG ADMINISTRATION, DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE

Mr. GREY. $143,100.

Mr. HOLIFIELD. And did you expend that money?

Mr. GREY. As of February 29, $85,761.93 has been expended.

Mr. HOLIFIELD. Do you have any allocations in the previous fiscal year?

Mr. GREY. Yes, sir. A total of $105,195.

Mr. HOLIFIELD. And what have you requested for the coming fiscal year?

Mr. GREY. $390,000.

Mr. HOLIFIELD. In your work what has been your main accomplishment in the field you have been assigned?

Mr. GREY. We have three programs, a training program, a drug and food test program, and an effects of atomic or bacteriological or chemical warfare against packaged food program. Our training program is directed toward State food and drug officials, our cooperating officials. It is a course that has been designed in as simple as possible and down-to-earth language to acquaint these officials with the problems they would be confronted with if we were attacked with nuclear or special weapons.

Mr. HOLIFIELD. Has that been transmitted to them and received by them?

Mr. GREY. Yes, sir. We scheduled that program for 50 cities for this fiscal year and so far that program, as of this week, has been held in 41 cities with an attendance of 1,400 and we have 11 additional courses scheduled for the remainder of this fiscal year, which will total 52 cities against 50 planned.

Mr. HOLIFIELD. What has been the response to your training programs from the standpoont of the attitude of the local people.

Mr. GREY. Very good.

Mr. HOLIFIELD. Have they been hungry for this information and anxious to obtain it?

Mr. GREY. Yes, sir. We prepared a booklet or a training manual for these courses entitled "Civil Defense Information for Food and Drug Officials." Due to the use of this manual in our training courses and information about it we have received more requests for this manual than we had booklets. We ran an additional printing. We contemplate more requests and an additional printing next year. We have received requests for refresher courses and additional courses in some of the cities and States where we were only able to hold one course.

Mr. ROBACK. How up to date is the information upon which this booklet is based?

Mr. GREY. Current.

Mr. ROBACK. All right. Will it require revision when new information on radioactivity is released?

Mr. GREY. Yes, sir.

Mr. ROBACK. It will require revision?

Mr. GREY. Yes, sir.

Mr. HOLIFIELD. Are there any other questions?

Mr. ROBACK. Just one question with regard to a study made by an advisory committee.

Mr. HOLIFIELD. Yes, sir.

Mr. ROBACK. This sets forth rather extended recommendations for duties and studies to be made by the Food and Drug Administration, does it not?

Mr. GREY. Yes, sir.

Mr. ROBACK. If those recommendations were carried out, what would be the order of magnitude of expenditures?

Mr. GREY. We are trying to figure that now, sir, but we do not have the answer. It would be a tremendous sum.

Mr. ROBACK. In comparison to the civil-defense-type studies you are now undertaking?

Mr. GREY. Yes, sir, I would say to fully implement the recommendations of this committee, if done by the Food and Drug Administration, would require an appropriation larger than our regular appropriation for our normal operations.

Mr. BREWER. On that point, Mr. Chairman, could we accept for the record, supplementing his prepared statement, the summary, conclusions and principal recommendations of this report. There are about 3 or 4 pages in this part of the advisory study.

Mr. HOLIFIELD. Without objection, that will be received.

Mr. GREY. May I suggest that the summary, conclusions, and principal recommendations as a whole be put in, it runs some 4 or 5 pages.

Mr. HOLIFIELD. Without objection, that will be received for the record.

(The document referred to is as follows:)

SUMMARY, CONCLUSIONS, AND PRINCIPAL RECOMMENDATIONS

SUMMARY AND CONCLUSIONS

1. At the request of the Food and Drug Administration a study has been made of the present preparedness of the major food processing and warehousing industries with respect to overt or covert special weapons attack and it is concluded that these industries are almost entirely unprepared for such possibilities. Since transportation of food is often an intervening step, it has been included and the situation is much the same for transportation as for processing and warehousing.

2. The food processing, transportation, and warehousing industries are aware of the possibility of overt attack and the results of radiological warefare because of civil defense activity and general publicity. These industries, however, are generally unaware of the serious possibilities or results of covert attack involving the use of bacterial or chemical warfare.

3. While the results of an overt attack could be serious to these industries in the area of attack, the Federal Civil Defense Administration and other agencies appear to help in coping with the situation.

4. Although considerable information is available concerning overt attack involving RW, these industries in general have neither availed themselves of this information nor studied the problem. Information on the overt use of BW and CW, on the other hand, has not been available.

5. Certain segments of the food industry are extremely vulnerable to covert activity with BW or CW agents or both and possibly to RW because of the characteristics of manufacturing processes, the nature of certain foods and their ingredients, and the general unawareness of management, technical staff, and labor concerning the potential problem.

6. The fact that the food industries are unaware of the hazard of covert use of chemical, biological, and/or radiological (CBR) warfare and that the Federal Civil Defense Administration (FCDA) and other agencies are unfamiliar

with the complexities of food processing, makes the problem of the covert use of CBR warfare agents acute and serious.

7. Quality control as practiced in the food industries today cannot protect against CBR warfare.

8. Under present conditions of food manufacture, packing, and distribution, it would be possible to contaminate sufficient food with biological or chemical agents or possible radiological warfare (RW) agents to impair the health or endanger the lives of large numbers of people scattered over wide areas in the United States.

9. Although the susceptibility of major food industries to the covert use of biological, chemical, and possible RW agents varies greatly with the particular industry and even the manufacturer, certain generalizations can be made.

(*a*) Processes involving the use of heat for preservation (e. g., canning) may be considered safe insofar as biological agents are concerned unless there is tampering with heat control instruments or seaming machines.

(*b*) Processes involving the use of open collection, mixing, holding and storage tanks and sumps are particularly susceptible to covert attack with special weapons.

(*c*) Ingredients used in processing, such as sugar (particularly liquid sugar concentrates), salt, vinegar, water, shortening, baking powder, leavening agents, chocolate, gelatin, starch, etc., offer particular hazards as carriers for CBR agents.

(*d*) Fatty foods present special problems insofar as CW is concerned.

(*e*) Materials transported in tank cars or trucks (e. g., liquid sugar, shortening, wines) are especially susceptible to covert acts during the transportation.

(*f*) Minor ingredients such as spices, flavors, glutamate, food color, enzyme and vitamin concentrates, and preservatives conceivably could be carriers for chemical agents if sufficiently potent agents are used.

(*g*) Where large amounts of air are brought in contact with the food (e. g., in pneumatic transfer of flour, spray drying, dehydration, etc.) the food may be vulnerable to contamination with CBR agents.

(*h*) Since water is used so extensively for washing, heating, cooling, processing, and as an ingredient, and since it is frequently suceptible to contamination, it is of extreme importance insofar as both overt and covert special weapons attacks are concerned. Water-treatment operations such as chlorinators, ion-exchange systems, and others offer possibilities for covert attack.

10. Food which are stored in refrigerated warehouses are relatively unvulnerable to CBR warfare agents so long as the buildings are intact and prudent steps are taken to prevent unauthorized entrance.

11. Food which is thoroughly cooked in the home should be relatively safe against BW but it is not safe against CW or RW agents.

12. Monitoring facilities for the detection of radioactive fallout are seriously inadequate.

13. Laboratories and potential facilities for the detection of biological and chemical contamination are at least partially available in the food industries, but specific and ready know-how is largely lacking.

14. Facilities for clean-up are generally available for sanitizing and decontamination, but ready information and know-how with regard to CBR agents are lacking.

15. There is an urgent need (*a*) for certain research to develop corrective measures which will reduce vulnerability to covert attacks, and (*b*) for an education program to familiarize management and techniologists of food industries with the potential problem relative to overt and covert attacks on the food industries.

16. A great deal of valuable information is widely scattered through various Government agencies, but unfortunately this is of little use to the food industries because of the lack of integration or availability.

17. Recommendations to improve the present situation are included in the report.

PRINCIPAL RECOMMENDATIONS

The committee recommends that:

1. The Food and Drug Administration accept leadership in bringing about greatly increased coordination among various governmental agencies including the Federal Civil Defense Administration, United States, Department of Agri-

culture, United States Public Health Service, the Business Defense Services Administration and the Office of Technical Services of the United States Department of Commerce, the Atomic Energy Commission, the many pertinent divisions of the Department of Defense and others concerned, insofar as information relating to food industries protection is concerned.

2. The FDA provides special trained personnel to work with and encourage food trade associations and pertinent scientific societies (e. g., Institute of Food Technologists) to establish local committees in metropolitan areas to study local and particular industry needs and to assist in laying plans for, and training management and technologists in, steps to be taken in an emergency.

3. The FDA apprise the food management and technical personnel of the processing, transportation, and warehousing industries of their vulnerability to the effects of overt and covert special weapons attack. Two means of accomplishing this may be by direct contact with a few key members of the industry, who in turn would contact others, and through trade organizations, scientific societies, etc.

4. The FDA obtain visual aids and appropriate slides and movie film to be used with live animal demonstrations to acquaint and interest management and technical personnel concerning the existence of the real danger of a special weapons attack upon our food supply.

5. The FDA arrange for the publication of an unclassified manual containing information on detection, decontamination, sanitizing, and handling foods, equipment, and premises contaminated with CBR agents. This publication must be made available to food industry management and technologists.

6. The FDA provides information for indoctrination and training programs and procedures for handling publicity in event of an emergency so that false rumors involving food supplies will be stopped.

7. The food industries be encouraged to assume responsibility for the above-mentioned indoctrination, training, and publicity programs through local meetings of scientific societies and trade organizations.

8. The FDA work with the food industry to develop and hold ready for Presidential proclamation of a practical and relatively uniform system for code labeling of food packages for use in case of a national emergency.

9. The FDA prepare a list of commercial and industry laboratories with notation of the competence and facilities of each so that any food company may know where reliable counsel and test work of kinds needed in an emergency can be obtained. Representative personnel from these laboratories should be included in any educational and planning program.

10. Research be undertaken to develop a simple and inexpensive but reliable manitoring device for RW that is feasible to own and use even in the smallest of food plants.

11. Research be undertaken to develop a simple but reliable procedure for the detection of CW agents that is feasible to use even in small food plants.

12. The FDA develop information, or arrange for research if information is not available, on the stability of agents used in special weapons attack in various foods and under various conditions of processing, packaging, and storage.

13. The FDA compile for the food industries' use a carefully selected list of pertinent literature on information broadly helpful to guard against overt and covert special weapons attack.

14. The contents of this report remain unclassified and be made available to all interested people.

Mr. ROBACK. If in the near future you come to some estimate of your budgetary requirements we would like to be advised about it.

Mr. GREY. Yes, sir.

Mr. HOLIFIELD. Do you feel that you are adequately covering this field with the appropriations which you have been allowed?

Mr. GREY. That is rather difficult to say. I would say so far our main difficulty has been obtaining adequate space for our studies on the possibility of the use of bacteriological or biological agents as food contaminants. That requires unusual laboratory space and facilities and we have been unable to obtain these. This is slowing down our

program but it is no fault of FCDA as far as the delegation is concerned.

Mr. ROBACK. Are there any problems with respect to interpreting the delegations as far as your agency is concerned?

Mr. GREY. No, sir.

Mr. HOLIFIELD. You are satisfied with the delegation to you of your responsibilities from FCDA?

Mr. GREY. Yes, sir.

Mr. HOLIFIELD. And that you can discharge them if you are provided with adequate funds?

Mr. GREY. Yes, sir.

Mr. HOLIFIELD. No further questions of Dr. Grey. We will excuse you at this time and we regret that time presses us.

I have read your statement and it is a very valuable statement and we may want to call you back before us at some future time for consultation.

Mr. GREY. I will be very willing and anxious to come back at your desire.

Mr. HOLIFIELD. Thank you.

If Dr. John Ludington will come forward.

Dr. Ludington, we will accept your statement also for the record at this point and I will ask you the question as to how much you have been allotted in the way of finance to discharge your responsibilities.

(The document referred to is as follows:)

STATEMENT OF JOHN R. LUDINGTON, DIRECTOR, CIVIL DEFENSE EDUCATION PROJECT, OFFICE OF EDUCATION, DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE

Mr. Chairman and members of the committee, we are pleased to report to you briefly about the responsibilities assigned to the Office of Education as a result of Federal Civil Defense Administration Delegation No. 1 to the Department of Health, Education, and Welfare. The Office was asked to undertake two tasks:

(1) to plan, develop, and distribute materials through appropriate channels in order to integrate the teaching of civil-defense skills, knowledge, and fundamentals of behavior during emergencies in all possible subjects; and

(2) to provide technical guidance concerning the provision of shelter and other protective measures designed to minimize injury to personnel and reduce damage to vital components of educational institutions.

Because of budget limitations, work has been undertaken on only item (1) above.

Work was begun late in fiscal year 1955 on a half-year basis with the establishment of a small civil defense education project staff in the Division of State and local school systems.

As a preliminary step visits were made to several State departments of education and school systems in target areas to determine action which had been taken in the development of school civil-defense plans and programs for the protection of school personnel. These visits revealed that developments were limited. School officials indicated interest in doing something but reported that they did not know what they should attempt to do and that they were not receiving civil-defense information through existing channels.

As a result of this initial survey Commissioner Brownell urged chief State school officers to name individuals responsible for the coordination of civil defense in schools. During fiscal year 1955, 38 States and 2 Territories named coordinators of civil-defense education. Today 46 States and 7 Territories have designated coordinators.

In order to supply current civil-defense information to education officials, a civil-defense education information sheet series was initiated. These sheets contain factual data on various phases of civil defense of interest and value

to school personnel abstracted and digested from official FCDA sources. To date 36 different releases have been prepared and distributed to State education officials, coordinators of civil-defense education, school administrators, committee members, libraries, and others interested in civil defense in schools.

This series has been very favorably received and in numerous instances large quantities of individual sheets have been reproduced by State and local groups.

Our most significant activities are built around formal agreements with State departments of education in Connecticut, Michigan, and California for the establishment of civil-defense education pilot centers. These centers have developed instruction materials for use by elementary and secondary school teachers. These publications were prepared by teachers, supervisors, administrators, and curriculum specialists in State and local school systems according to established procedures and policies in each of the States. The titles of these publications are:

Connecticut: "Education for Wartime and Natural Disaster Emergencies."

Michigan: "Civil Defense in the Classroom: A Handbook for Teachers."

California: "Civil Defense for Personal and Family Survival: A Handbook for Teachers, Students, and Parents" and "Some Suggestions for Introducing Civil Defense Education Into the Curriculum."

Directors of each of the State pilot centers have conducted numerous meetings of school administrators and teachers in the preparation of these bulletins and the implementation of school civil-defense programs. The pilot program, although centered in 3 States, has not been limited to these States only. Our records show active working relationships with 24 States. For example, the Connecticut center has worked with representatives of 8 States in the New England area. Michigan has involved representatives from 13 Midwestern States and in addition has held eleven 1-day regional institutes in all parts of the State and 1 statewide conference of curriculum coordinators. California is planning a Western States conference of key officials to be held this spring which will include 5 additional States.

The Office of Education has provided consultant assistants and supplied technical information to the directors of the three pilot centers.

The materials developed in the three States were reviewed in a 5-day conference sponsored by the Office of Education in cooperation with FCDA in Battle Creek. This conference was attended, at no expense to the Government, by representatives of 20 States and 5 large city school systems in target areas. Agreement was reached on the content of an Office publication based upon the experience in the three pilot States and the recommendations of the conference participants.

A manuscript is now being developed by the Office of Education which will be distributed nationally for use during the 1956–57 school year. This publication is designed as a handbook for teachers and administrators on the school's role in civil defense.

In addition to these activities the Office staff has provided, upon request, limited consultant and advisory assistance to school systems interested in various phases of civil defense.

Plans for fiscal year 1957 call for continued work on this project, and if funds are provided, the Office will undertake the development of shelter and other protective measures which should be incorporated in new and existing school buildings.

In conclusion, I might add that the importance of schools to the total civil-defense effort is shown by the fact that approximately 25 percent of our population is now associated as students, instructors, or administrators in this country's elementary, secondary, and higher institutions of learning. If schools but organize and conduct effective instructional and self-protection programs for the student population and at the same time become neighborhood centers for the education of adults, general civil-defense knowledge and skills can thereby be transmitted to a large segment of the total population.

In our opinion civil defense is a vital aspect of all our daily lives and will probably remain so for some time. The teachers in our schools must have accurate information on civil-defense matters so that plans can be developed and personnel instructed on how to care for oneself and others in the event of an emergnecy. This can be done if the normal lines of communication and administration in education are utilized to the fullest extent in the operation of civil-

defense programs. Educators in the States have shown interest and enthusiasm for the assistance now being given them as a result of this delegation.

(Budget data submitted by Dr. Ludington are as follows:)

Office of Education—Civil-defense estimates

[In dollars]

By objects	Fiscal year 1955			Fiscal year 1956			Fiscal year 1957		
	Initial request	Bureau of budget allowance	Available	Initial request	Bureau of budget allowance	Available	Initial request	Bureau of budget allowance	Available
01 Personal services	93,620	77,120	27,170	50,405	39,910	40,680	102,870	96,750	
02 Travel expenses	16,900	15,280	5,000	12,000	6,240	5,680	12,500	12,200	
04 Communication services	3,600	3,600	800	1,050	1,050	1,250	2,250	2,250	
06 Printing and reproduction	12,000	12,000	5,000	8,060	8,000	7,000	17,600	14,000	
07 Other contractual services	83,000	71,000	52,350	124,365	93,290	61,590	169,450	119,450	
08 Supplies and materials	1,600	1,600	800	950	950	1,100	2,450	2,450	
09 Equipment	1,000	1,000	1,600	540			3,000	2,100	
15 Taxes and assessment	900	900	480	690	560	400	880	800	
Totals	212,620	182,500	93,200	198,000	150,000	117,700	311,000	250,000	

STATEMENT OF DR. JOHN R. LUDINGTON, DIRECTOR, CIVIL DEFENSE EDUCATION PROJECT, OFFICE OF EDUCATION, DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE

Dr. LUDINGTON. In the year 1956, sir.

Mr. HOLIFIELD. In the year 1956.

Dr. LUDINGTON. $117,700.

Mr. HOLIFIELD. Did you have an allotment in 1955?

Dr. LUDINGTON. It was $93,200.

Mr. HOLIFIELD. Anything before that?

Dr. LUDINGTON. Nothing before that.

Mr. HOLIFIELD. What have you asked for in 1957?

Dr. LUDINGTON. The Budget Bureau allowance was $250,000. The increases are due to the fact that in the years 1955 and 1956 we have only worked on one item in the delegation.

Mr. HOLIFIELD. I notice in the beginning of your statement that you said because of budget limitations work has been undertaken only on item 1, which was to plan, develop, and distribute materials through appropriate channels in order to integrate the teaching of civil-defense skills, knowledge, and fundamentals of behavior during emergencies in all possible subjects. I would say that was quite a wide delegation.

Dr. LUDINGTON. We felt it was.

Mr. HOLIFIELD. I wondered if you feel you have been able to accomplish the delegation of No. 1.

Dr. LUDINGTON. We feel we have made rather favorable progress in that direction through our pilot State program, involving the States of Connecticut, Michigan, and California. We used the established educational authorities. We entered into formal working agreements with them to use educators and local and State education

systems, to take technical materials which we submitted to them and to put them in the form of handbooks and guides for elementary and secondary school teachers.

Mr. HOLIFIELD. You stated you had agreements with three States out of the 48.

Dr. LUDINGTON. Yes, sir.

Mr. HOLIFIELD. Does that mean that these documents you have prepared have only been distributed to those States.

Dr. LUDINGTON. They have been extensively distributed in the three States. They are available in other States on more limited distribution basis but the key to the approach that we used was to utilize the best of the three State publications and the recommendations of the national conference. The office staff is now preparing a publication for national consideration of distribution. In addition the staffs in the three pilot center States have developed an evaluation instrument so we can get reactions from school systems to show the value of this material. In addition we are getting reports from the three experimental States on practices and procedures which are made available to other States. This is done through our civil defense education information series, of which we have had some 36 different releases. This information also goes to all 48 States. Another achievement has been the identification of one person, in most cases on a part time basis, in each State department of education to serve as the coordinator of civil defense education actiivties in the States.

Mr. ROBACK. When that California booklet was prepared, as an example, did they rest upon certain assumptions with regard to civil-defense planning that were furnished by the FCDA?

Dr. LUDINGTON. We furnished that kind of information through our office but in addition the staff in California worked closely with the California State civil-defense organization.

Mr. ROBACK. Isn't it a fact that there are rather detailed recommendations for family behavior in the course of evacuation, let us say?

Dr. LUDINGTON. Yes, sir.

Mr. ROBACK. So the California booklet presumes that evacuation would be a dominant civil-defense activity without regard, let us say, to the possibility that it might not be feasible for California or parts of California?

Dr. LUDINGTON. We recognized that these recommendations have to be adopted to local city conditions and local school districts.

That is, we don't feel that a universal plan will apply in all school districts throughout the entire country. This guide developed at the State level is now being used according to our recent reports in 78 school districts in California where adaptations are being made of those recommendations in the development of protection plans for the youngsters in particular schools.

Mr. ROBACK. Are youngsters in southern California acquainted with the limitations of evacuation as a technique, since it goes into rather considerable detail as to what to do during evacuation?

Dr. LUDINGTON. This material is not information for children. We feel that some of that information would be desirable for youngsters inasmuch as our population is quite mobile.

And some general knowledge of evacuation plans and procedures ought to be made available to schoolchildren, even though they may

not be conforming to such a plan in the community in which they are now living.

Mr. BREWER. Was this general function performed by the Federal Government before you received your delegation?

Dr. LUDINGTON. No, sir; our activities in civil defense prior to the delegation were simply liaison participation on a part-time basis by one person in the Office of Education.

Mr. BREWER. And you feel that because of the nature of your general functions, that is, the Office of Education, you are the most suitable agency to carry out this function with respect to schools and teachers and the general field of education.

Dr. LUDINGTON. We feel we have gotten a hearing in the year and a half that we have been operating, whereas prior to that time there was considerable apathy on the part of school people and school organizations and agencies had not been involved directly in civil-defense planning.

Mr. ROBACK. Does your planning for 1957, your budget planning for 1957 contemplate shelter advice?

Dr. LUDINGTON. We have included that item in the delegation in each fiscal year, but because of reductions we have not undertaken it. It is in the plan for 1957.

Mr. ROBACK. Where are you going to get the advice that you are going to give to local people in the construction field?

Dr. LUDINGTON. Well, we will take such information as is available from FCDA. We have obtained some technical data from other organizations, such as the Navy. We felt that our best procedure was to turn this technical information over to a competent engineering and architectural firm to develop the specific building designs. Then, in cooperation with school experts, show how these specifications and standards can be incorporated in either existing or new structures.

We realize that there is not as much information on this subject available as we would like to have.

Mr. ROBACK. Is this firm located in New York City?

Dr. LUDINGTON. We have not approached any single firm at the moment on this contract.

Mr. ROBACK. Do you expect to get some model design; is that the idea?

Dr. LUDINGTON. Yes; some prototype illustrations of what you would do in school situations of various size and in varying proximity to target zones. There are many schools where the only hazard would be fallout. Others would have to consider blast and heat as well. School people generally, I think, are reluctant to think of a school building being designed in its entirety as a bomb shelter, but we do feel that a portion of a building could provide some protective shelter for youngsters and, at the same time, serve other proper purposes as well.

Mr. ROBACK. What kind of incentives or requirements does the Office of Education have which would facilitate or encourage the construction of sheltered buildings?

Dr. LUDINGTON. We have no incentives other than making the problem known to school communities that are planning school buildings and to architects who may be inclined to incorporate such specifications as we might develop in school buildings to be planned. We have no financial incentives at the moment, matching grants or otherwise.

Mr. ROBACK. Would this Federal aid to education in defense impact areas carry any leverage?

Dr. LUDINGTON. The pattern of that program might, but in its present form we could not use that.

Mr. BREWER. What type of advisory services does your office furnish to States upon request with respect to civil defense?

Do you have specific requests coming to your office?

Dr. LUDINGTON. Yes. We have requests for printed information, materials that can be used by education committees that are now concerned with civil defense. We get requests from teachers in specific areas as to what they can do in a course like social studies, science, or home economics, and we indicate where and how information can be obtained. If it is a part of our information-sheet series, we supply it directly.

Mr. BREWER. Do you have any plans for building up this part of your staff?

Dr. LUDINGTON. We have proposed a small expansion next year because we have had to curtail some activities in this regard in order to work on the publication which we hope to have printed and ready for distribution in the schools next fall. I might say that all of these plans were very carefully reviewed by the chief State school officers executive committee, and by each of the departments of the National Education Association. We have had no adverse reactions from anyone. We would like to see the kind of incentive that we have provided in California, Michigan, and Connecticut, operating in other States.

You would be interested to know, however, even though our working agreement is with the State of Connecticut, there is today in Boston a meeting of State education officials representing eight States in the New England area working on this education problem in civil defense. We have had that kind of working relationship as a result of that pilot center all the time.

Michigan has involved representatives from 13 nearby States in the development of their publication. And California has plans for five Western States meeting during the first week in June.

Mr. BREWER. In other words, what you are doing here is stimulating action on the State level by contracting with them to develop their own plans and publications on this.

Dr. LUDINGTON. That is right. But our intention is that the experiences of the pilot center States be of value to surrounding States and ultimately to the Nation as a whole.

Mr. HOLIFIELD. On that question of making available these different pamphlets and books you have issued. You are not equipped financially to furnish those in great quantities to the schools of the Nation; are you?

Dr. LUDINGTON. No, sir.

Mr. HOLIFIELD. You furnish them to the State boards of education and if they want to they can reproduce them.

Dr. LUDINGTON. These sheets are handled that way. We have numerous instances of where these have been reproduced in large quantities in the States.

We do not supply them in quantities of more than 25 to anyone, at any one address.

Mr. HOLIFIELD. I'm sorry we don't have the time today to go further with you on this matter. I have looked through some of these pamphlets here and they seme to be rather well done, and it occurs to me that without passing judgment upon the job which you have done in your delegation that the problem of educating the people is going to be almost the basic problem in this highly important field. It also occurs to me that the United States Department of Education is sooner or later going to be saddled with a tremendous job, a much bigger job than you have done to date if the people are to be informed. This may be one of the best ways that we can get the real information to the mass of the population through the schools, with the proper type of television announcements from people in responsible positions that will be respected, by the people when they are heard.

Dr. LUDINGTON. That's right.

Mr. HOLIFIELD. Our staff will study this and I will also study it and other members of the committee and it may be that we will want you to come back before us again on some questions.

Dr. LUDINGTON. We will be pleased to do so.

Mr. HOLIFIELD. Are there no further questions at this time?

If not, the meeting will stand adjourned.

(Whereupon at 12:25 p. m. the hearing was adjourned.)

CIVIL DEFENSE FOR NATIONAL SURVIVAL

TUESDAY, MARCH 27, 1956

HOUSE OF REPRESENTATIVES,
SUBCOMMITTEE ON MILITARY OPERATIONS
OF THE COMMITTEE ON GOVERNMENT OPERATIONS,
Washington, D. C.

The subcommittee met at 10 a. m., in room 1501, New House Office Building, Hon. Chet Holifield (chairman of the subcommittee) presiding.

Present: Representatives Holifield, Griffiths, Riehlman, and Lipscomb.

Also present: Michael P. Balwan, staff director; Herbert Roback, director of investigations; Earl Morgan, of the subcommittee staff; and Carey Brewer, Legislative Reference Service, Library of Congress.

Mr. HOLIFIELD. The subcommittee will be in order.

In pursuance of our objective of exploring the problems involved in civil defense in the nuclear age we have asked some distinguished doctors from the Atomic Energy Commission, Brookhaven National Laboratory, to appear before us this morning, to give us testimony on the effects of radioactivity on the human body, the possible hazards that may occur after the explosion of these weapons.

Our first witness this morning is Dr. Charles L. Dunham, Deputy director of the Division of Biology and Medicine of the Atomic Energy Commission, and I believe he will testify on radiation effects. Dr. Dunham, will you please step forward?

Good morning. Happy to have you here with us.

STATEMENT OF DR. CHARLES L. DUNHAM, DIRECTOR, DIVISION OF BIOLOGY AND MEDICINE, ATOMIC ENERGY COMMISSION

Dr. DUNHAM. It is a treat to testify before you.

Mr. HOLIFIELD. We have seen you before the Joint Atomic Energy Committee, and it is good to have you with us.

Dr. DUNHAM. First for the record, may I correct my title? Scratch the deputy.

Mr. HOLIFIELD. We congratulate you on your elevation.

Dr. DUNHAM. Thank you. Mr. Chairman, I have been asked to testify before your committee on the matter of medical effects of atomic bombs. I understand that Dr. Cronkite will testify today on the medical effects of the fallout, so my testimony will concern itself chiefly with the effects of atomic bombs detonated in the air.

Now, only two atomic explosions have ever been used against cities. They were Japanese cities. Furthermore—and this is very important—the Japanese had never heard of an atomic bomb until they

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experienced one. We know that in Hiroshima 1 bomb killed 70,000 persons and destroyed 4.7 square miles of the city. I will do my best today to give you some perspective as to what medical problems are posed by atomic warfare. Dr. Libby testified before this committee on January 1 an atomic explosion releases three general categories of energy in tremendous quantity. These are the shock wave, radiant heat, and nuclear or ionizing radiation. Each of these is damaging to humans in its own special way.

A nominal bomb is equivalent in its release of energy to 20,000 tons of TNT. Bombs of this general power were used against Japan and exploded in the neighborhood of 2,000 feet above the ground. The pressure wave causes virtually total destruction of all ordinary structures within a radius of one-half mile from ground zero (the point on the ground immediately below where the explosion actually occurs).

It causes severe damage out to 1 mile and moderate to partial damage out to 2 miles. Lacerations from flying debris actually occurred at a distance of 12,000 feet from ground zero at Nagasaki. Now, with a 40,000-ton TNT equivalent bomb the area of virtually total destruction would extend for nearly two-thirds of a mile from ground zero and with a 10-megaton TNT equivalent bomb, it would extend for more than 3 miles.

The front of the shock wave travels outward at a finite speed slightly greater than the speed of sound.

It takes approximately 5 seconds to travel 1 mile in air from the point of explosion. Thus sufficient time elapses between the flash of light and the arrival of the shock wave for a person caught in the open 1 mile away from the nominal bomb to fall to the ground and thereby avoid being knocked down by the shock wave.

A person 10 miles from a 10-megaton weapon would have the better part of a minute within which to take evasive action. In either case, however, he would be in an area where the indirect effect of blast—falling and flying objects—would be very great, although he could survive the direct effects.

In fact it is worthy of note that whereas an overpressure of a few (2 to 5) pounds per square inch will cause moderate to very severe damage to well-built brick houses our best evidence based on experiments at Upshot-Knothole and at Teapot indicate that it would take 15 pounds per square inch overpressure or more to produce direct effects on human beings.

These effects include such things as hemorrhages into the lung and heart, air embolism, that is air getting into the blood vessels and going to the brain or other parts of the body and perforated eardrums.

In other words, as Dr. Libby pointed out, of persons inside a 2-story brick structure at 12 miles from a 10-megaton weapon at the time the blast wave hit, 85 percent would be killed outright and the rest would be seriously injured. This is way beyond where direct radiation effects would be important but where on a clear summer day third-degree burns would be received on exposed skin surfaces by persons in the open.

The thermal radiation represents a very large proportion of the bomb energy release. It has been estimated that for a nominal bomb 99 percent of this thermal energy is emitted from 0.3 to 1 second after the explosion.

The ultraviolet radiation is emitted in the first fraction of a second and thus represents only a small fraction of the total thermal energy.

It appears probable that infrared and visible-light radiations rather than the ultraviolet light constitute the main factor in causing flash burns. Even here there is a slight factor of safety in that a person would have approximately one-half second after he sees the flash of light to fall behind some object interposed between him and the source and thereby reduce perhaps by half the amount of radiant heat to which he would be exposed.

The intensity of the heat, plus the short duration of exposure, less than 1 second are responsible for the peculiar character of the flash burns produced. Within the depth to which the thermal radiation penetrates, the tissue is completely destroyed.

At 3,600 feet from ground zero, blackening indicated that actual charring occurred.

On the other hand, the depth of penetration is relatively slight and even ordinary clothing gave excellent protection to the covered parts of the body. In other words, only body surfaces exposed in a direct line with the source of the heat wave would be burned.

For a 10-megaton weapon the same thermal effects would be expected at 10 to 12 miles. The thermal wave from a 10-megaton weapon lasts much longer than the less-than-a-second pulse from a nominal bomb, so there is again more time for evasive action, which at greater distances, where the hazards from the indirect effects of blast would be less, could be lifesaving. Two other factors should be mentioned.

One, the more haze in the atmosphere the less the thermal effect at a given distance, and two, the colder the surface of the skin at the time of exposure the less the effect.

That is, in very cold weather, freezing or subzero weather there would be appreciable diminuation in the effect of this thermal energy.

As to the burn itself, except for the uniformity of depth of the burn, and the peculiar pattern, limited as it is to exposed surfaces the burn is like any other and can be treated accordingly.

As you can see, fully clothed persons are likely to receive burns only on 1 side of the head and neck and on the 1 side of 1 or 2 hands depending on how they are positioned with relation to the flash.

Of themselves such burns should not prove fatal. Of course, if they were wearing only shorts a third-degree exposure of this sort to half the body could be fatal.

It is uncertain how much of the fire which swept Hiroshima and Nagasaki after the bombings was directly attributable to radiant heat. Certainly there was enough structural damage with accompanying broken gas mains, electric short circuits, and the like to account for the first.

The evidence suggests that most of the flash fires, those produced directly by the thermal wave, were extinguished almost immediately by the wind of the blast.

One other possible source of casualties must not be discounted. The great flash of light is so intense that persons a few miles from a nominal and amny miles, perhaps 30 or more, from a 10-megaton weapon, who were looking, not necessarily directly at but in the general direction of the bomb, would be temporarily blinded.

I ask you to fancy what this could mean to the drivers of automobiles on a crowded highway and the chaos which this would create, especially if it were dark at the time.

The nuclear or ionizing radiations given off by an atomic explosion are of several varieties. The initial radiation from a nominal bomb including that produced by the fission process itself consists of neutrons and gamma rays given off during a period arbitrarily set at 1 minute.

The gamma radiations emitted during the first minute include the first installament of the so-called delayed gamma radiations given off by the fission products as they undergo radioactive decay. These are by far the most important radiations given off by the bomb.

Both the neutrons and gamma radiations cause casualties from an air blast. Alpha radiations present from nonfissioned material and beta radiations or electrons are given off in tremendous quantities by radiactive decay of the fission products, also cause a hazard when fallout occurs.

Neither of these latter two radiations is very penetrating and as most of the material in the case we are talking about is carried upward by the hot gases formed in the explosion, no important concentration of it appears on the ground below.

This would not be the case, however, with a ground burst or an underwater burst.

The neutrons are mostly emitted so promptly and travel so fast that those reaching 3,000 feet do so in less than a second. No evasive action is possible. That significant amounts of neutrons do penetrate to such distances is evidenced by the fact that for a fact radiation cataracts have occurred in persons who survived the Hiroshima explosion and were 3,250 feet from the hypocenter.

We know the gamma dosage at that point was insufficient of itself to produce cataracts.

Mr. HOLIFIELD. Would there be a substantial difference in the range of neutrons from a 10-megaton bomb as compared to this bomb you are speaking of which was in the 20,000-ton TNT equivalents?

Dr. DUNHAM. Both the gamma rays and the neutrons from a megaton weapon extend farther than from a nominal weapon. On the other hand not a great deal farther—and I think I can come to that point in a minute.

The gamma radiations penetrate even farther. From a nominal bomb the LD 50 dose of 400 r, the dose which it is estimated is sufficient to kill 50 percent of humans receiving it, occurs at about 3,700 feet from ground zero or nearly three-fourths of a mile. The dosage at 1 mile is about 100 r. With a 40 kiloton bomb the 400 r range is a little more than three-fourths of a mile and with a 160 kiloton it is not much over 1 mile.

As the bombs get bigger, there is not a corresponding increase in the distance out to which the radiation extends. In fact, this distance relatively speaking becomes much less.

Evasive action is theoretically possible against gamma radiation because only about one-half of the gamma ray dosage is received during the first, second, and 80 percent in the first 10 seconds.

With megaton weapons the gamma pulse is a little larger and the distance penetrated somewhat greater. Unlike the thermal radiation

the gamma radiation penetrates clothing quite readily. For instance at 3,000 feet from the explosion of a nominal bomb, that is 2,250 feet from ground zero, the dosage is approximately 2,000 r. It would take 12 inches of concrete, 20 inches of packed soil, 4 inches of iron, or 2 inches of lead to reduce this to 400 r. To reduce it below 100 r, it would take a little over 20 inches of concrete and 30 inches of packed earth, to reduce it below 100 r.

An air burst leaves no important residual radiation either in the form of fission products, fissionable material, or induced radiation.

With specific reference to the fallout of fission products, outfall from an airburst is not likely to occur unless there are very special meteorological conditions present whereby a cloud of fission products would become engulfed in a rain cloud and shower down on the ground below.

Even so much contamination from outfall is not likely to be militarily, nor from a civil-defense standpoint, very important.

The following possibilities, however, should be kept in mind.

1. An underwater burst of a nominal bomb near the heart of a city produce from the base surge a radioactive mist emitting gamma rays which would produce lethal to midlethal doses of radiation for a mile in all directions and would be lethal to anyone engulfed in it for a few miles downwind. Thermal effects would be greatly diminished or absent and blast effects would be somewhat less than from an air burst. An underwater burst would deposit important amounts of fission products and unfissioned bomb material over the same general area as would be involved in the blast effects, plus the area of downwind drift of the base surge.

Mr. HOLIFIELD. I would like to ask you at this point some questions with respect to this type of a burst. If a megaton type of bomb was exploded offshore from New York, let us say, during the time when there was a 20- or 40-mile wind blowing in from the water over the city, what would be the effect of that moisture being blown over the city of New York?

Dr. DUNHAM. That moisture would all contain radioactivity and it would be very intense radioactivity.

Mr. HOLIFIELD. The sodium in the salt water——

Dr. DUNHAM. There would be some induced activity in the sodium; that is correct.

Mr. HOLIFIELD. And the deposit on concrete and iron buildings, steel buildings would contaminate those structures with a persistent radioactivity; would it not?

Dr. DUNHAM. That is correct.

Mr. HOLIFIELD. Would you care to say whether this type of a burst would be more advantageous to an enemy than an air burst?

Dr. DUNHAM. I think from the standpoint of putting a large civilian economy out of commission for a while, this type of burst or a ground burst would be perhaps more effective.

Mr. HOLIFIELD. It would cause persistent radioactivity.

Mr. DUNHAM. That is correct.

Mr. HOLIFIELD. And probably less structural damage; would it not?

Dr. DUNHAM. It would cause within a few miles, within a mile or so, considerable structural damage.

Mr. HOLIFIELD. Even though it were exploded 100 feet under the water?

Dr. DUNHAM. I think it would have to be more than 100 feet under water to really diminish the structural damage effect from a megaton weapon. It would diminish it some, but not appreciably. If that were in close proximity to structures on the shore, one could expect very large structural damage.

Mr. HOLIFIELD. As I remember the Bikini tests—I am speaking now of the July 25 tests, 1946—were between the surface and the bottom of the lagoon which was about 100 feet deep at the point of explosion.

Dr. DUNHAM. Yes.

Mr. HOLIFIELD. There were some structural damages to the ships which were stationed nearby but those ships had the advantage of having a movable base and they could move with the shock.

Dr. DUNHAM. Right.

Mr. HOLIFIELD. But still the bows of the ships, such as the Saratoga were completely mashed in, this was a 20,000-ton bomb.

Dr. DUNHAM. Yes.

Mr. HOLIFIELD. It would be reasonable to suppose that if a megaton weapon were exploded in New York or San Francisco that there would be considerably large structural damage and the downpouring water from the uprising column of the explosion would contaminate these buildings for periods of months.

Dr. DUNHAM. Oh, yes.

Mr. HOLIFIELD. Possibly years as far as that is concerned.

Dr. DURHAM. Yes.

Mr. HOLIFIELD. Because some of the ships from the Bikini blast were contaminated more than 2 years past the date of the explosion to the point where you could not stay on them. I remember two of the ships I believe were towed to Mare Island Navy Yard.

Mr. DUNHAM. Yes.

Mr. HOLIFIELD. And they were still contaminated to the point 2 years later that people were not allowed to stay on except for a limited length of time.

Dr. DUNHAM. Yes.

Mr. HOLIFIELD. That type of a bomb, of course, could be placed surreptitiously by submarines or even by release at night from tramp steamers; could they not?

Dr. DUNHAM. Yes.

Mr. HOLIFIELD. All right; you may proceed.

Dr. DUNHAM. The radioactivity deteriorates very rapidly during the first 5 minutes and hours but the longer lived fission products, largely beta emitters, would be a problem for days and weeks and only accurate radiation detection could establish for how long a time a person entering this area could safely remain there.

A similar situation would follow a ground burst. As Dr. Cronkite is here to discuss the fallout aspects, I will make no further comment at this point.

Finally there is the possibility of a fizzle of ineffective explosion spilling fissionable material and fission products over a relatively small area.

This would constitute a very local hazard from alpha, beta, and gamma radiation. A big worry here would be to prevent inhalation

of appreciable amounts of fissionable material, as well as fission products.

The situation which would have to be faced following an explosion from a well-aimed 20,000-ton TNT-equivalent bomb exploded without warning over a large city is the problem imposed by some fifty to eighty thousand injured persons and 60,000 dead, with more or less total destruction of surface structures within a radius of 1 mile from the hypocenter of the blast and lesser damage farther out, followed almost immediately by large-scale fires in the 1-mile zone.

Any increase in the number or size of the bombs would serve to compound the picture. This situation obviously relates to incidents in which there has been an effective interception of enemy aircraft, in which the enemy has pinpointed his target to the exact location desired, and in which there has been an effective air-raid warning. Actually adequate deep shelters will protect not only against burns and trauma but against radiation either from a high air burst or from the lethal ground surge mist from an underwater blast. Proper radiation control will minimize the hazards of residual radiation.

Now what is the situation with the injured who are still alive a few minutes after the blast? Our best data on this from Nagasaki and Hiroshima is very deficient because only persons who were able to get up and walk away got to aid stations and eventually to emergency hospital facilities for treatment.

Mr. HOLIFIELD. May we stop there and go back to the previous paragraph?

Dr. DUNHAM. Yes.

Mr. HOLIFIELD. You bring out the fact that adequate shelters, deep shelters, will protect against burns and trauma and against radiation also. And yet there has been no program for the building of such shelters in the United States near target centers; has there?

Dr. DUNHAM. I know of no concerted program of that sort. There has been, as you know, quite a little experimental work looking toward the design of a really satisfactory shelter done at the Nevada Proving Ground, and I believe Mr. Bowman is going to testify on this point tomorrow.

Mr. HOLIFIELD. Does that strike you as strange that this Nation which is spending $35 billion a year for the military offense and defense has allowed 10 years to go by from the date of Hiroshima and Nagasaki with ever-increasing sizes of bombs without some tangible program of protection to the urban populations of our cities?

Dr. DUNHAM. It certainly isn't very logical in my opinion.

Mr. HOLIFIELD. We have a feeling in this committee as we listen to this testmony of having people telling us facts such as you are giving us this morning which have been proven to be facts by our atomic experiments and yet we see nothing—I won't say nothing—but we see very little being done to recognize that these facts are serious and that actually something should be done.

If you think that your child, if he goes into the street, will be killed by an oncoming automobile, you not only tell the child, but you take steps to either build a fence to keep him from doing it or take him by the hand and keep him from going into the street, into this hazard, yet the American people have not been given the protection or, in my opinion, they have not been brought to understand this hazard that actually exists.

Day after day we have this type of testimony before this committee and yet we have no real coming to grips with the problem.

Dr. DUNHAM. It is very hard to get people to face up to something and recognize something as unpleasant as this. I have certainly run into it in the talks I have given to lay people and even to physicians on this subject and I know that FCDA has that as one of the biggest problems.

Mr. HOLIFIELD. Do you have any suggestions as to how this lack of understanding and apathy and indifference can be overcome?

Dr. DUNHAM. Just more and more propaganda, but this is very difficult to achieve when the public is not in the frame of mind to receive it.

Mr. HOLIFIELD. I assume you use the word "propaganda"——

Dr. DUNHAM. In the benign sense of the word.

Mr. HOLIFIELD. In the benign sense of the word. More and more reliable information from authoritative sources might be more expressive of the meaning you intend.

Dr. DUNHAM. Yes, that is more exact.

Mr. HOLIFIELD. All right.

Mr. RIEHLMAN. Don't you think, Doctor, that some of the—maybe most of our problem is because many, many people have not had adequate information as to what they could do themselves personally to protect themselves against this type of explosion?

Dr. DUNHAM. I think a good deal of information has been distributed. Now, how far that has gotten, I would not be in a position to say, and as to what people have done with this information when they got it, it doesn't look like they have done very much.

Mr. RIEHLMAN. That is the point. What you were saying about getting this information to the people and impressing upon their minds what they can do for themselves is very important.

Dr. DUNHAM. Right.

Mr. RIEHLMAN. But I don't think there has been enough emphasis put on it through any publication or distribution of information to the population of our Nation. I know people in my own district, you talk with them about it and even though it might have also been available and has been in the past, very, very few have any idea what they can do to help themselves. They take it as a hopeless and helpless situation they find themselves in. That is the attitude that civil defense and everyone else is trying to overcome that there is something that can be done to help themselves.

Dr. DUNHAM. There is no question but what a great deal can be done.

Mr. HOLIFIELD. You may proceed. You had come to the point where we were going to talk about the ones who survived blast but were injured. You might start that paragraph again, Dr. Dunham, to get the continuity of thought.

Dr. DUNHAM. Now, what is the situation with the injured who are still alive a few minutes after the blast?

Witness the fact that less than 12 percent of hospitalized casualties were reported as suffering from fractures and almost all of these were fractures of the upper extremities.

The rest were apparently burned to death in the great fires which swept the cities within one-half hour after the bombings.

Assuming that we in this country could better handle this, we would have on our hands from 50,000 to 80,000 persons of whom 50 to 60

percent would have burns of varying severity; 50 to 60 percent would have varying degrees of traumatic injuries, broken bones, lacerations, concussions; and 20 percent would have received varying amounts of radiation. These injuries would include all degrees of severity from those requiring little to no treatment to those requiring immediate treatment for impending shock. You will note that these figures add up to over 100 percent. This is, of course, because the three casualty categories are not mutually exclusive.

Those casualties who have received doses of radiation sufficient to kill them in the first few days following the explosion will be actively sick, vomiting, and prostrate. Nothing we know today can be done to increase their chances of survival. Those who have received radiation in the midlethal range for humans (in the neighborhood of 400 r) are likely to be nauseated and somewhat ill during the first 24 hours. But, assuming they received no other injury, the majority of them would not require active care for another week. Those who received appreciably less than this dosage may also have some symptoms the first day but thereafter are not likely to show important manifestations. In other words those receiving serious radiation injury will (for a 10-megaton air burst very few if any pure radiation injuries would occur)—I will come to that later—be a relatively small group and with proper planning including intelligent triage, that is sorting and selecting casualties for various types of treatment, need not constitute an important drain on personnel and medical supply resources until several days after the disaster.

Mr. HOLIFIELD. What you are saying there if I understand is that the attempt to ascertain the degree of injury of masses of people would not be a matter of immediate concern, that you would have a few days before you had to determine the degree of their radiation.

Dr. DUNHAM. That is correct.

Mr. HOLIFIELD. Could you diagnose the degree of their radiation by any means known? Could you tell for instance if a man had a 150 roentgen or 250 roentgens at the end of a week?

Dr. DUNHAM. Not quite as precisely at that time. But Dr. Conkite has done a great many hemotalogical studies. He has studied the records from Japan, from Hiroshima and Nagasaki and he has shown if the total number of lymphacytes, not the total number of white cells, falls below 800 and this can happen between 24 to 48 hours, that person has had it.

If the count is higher the chances of survival or doing something for the patients are a great deal better.

Mr. HOLIFIELD. That depends mostly upon blood transfusions?

Dr. DUNHAM. Not just blood transfusions because that is given for hemorrhage or where there is a severe anemia, also antibiotics, rest, usual treatment for shocklike states, bland diet, maybe infusions of fluid into the vein if they get dehydrated from diarrhea.

Mr. HOLIFIELD. When we consider the possibility of an attack on many of our urban centers nearly simultaneously or simultaneously, do you have any confidence that we have enough adequately trained personnel to handle this job of care?

Dr. DUNHAM. I think we have made a beginning. We are just talking about the radiation injuries, because they will not be the biggest problem.

Mr. HOLIFIELD. The first week will be those who are injured by burns?

Dr. DUNHAM. The burns and the traumatic injuries. That takes a great deal of first-rate first aid directed by competent physicians and nurses. This is not perhaps an insuperable obstacle and with some intensive training, I am sure that a great deal could be done.

Mr. HOLIFIELD. Of course many of these people will also have radiation.

Dr. DUNHAM. That's right. That is a complicating factor, of course.

Mr. HOLIFIELD. Of course, if they do have radiation, and the effects are on the white cells and the platelets of the blood it would be almost impossible to treat them for exterior injuries; would it not?

Dr. DUNHAM. It would depend on how severe the injury was and how severe the platelet depreciation and depreciation of the white blood cells was.

Mr. HOLIFIELD. But a second- or third-degree burn and even a 200 roentgen radiation, the combination of the 2, while either might not be fatal, the combination of the 2 preclude the chances of recovery or curative measures; would it not?

Dr. DUNHAM. This would impair the chances but many people with that combination survived in Japan. If you have the burn of a half side of the face and the back of one hand a second- or third-degree burn, this is serious but would not prove fatal. With, say, 200 roentgens on top of it, his chances would be reduced but he would have a good chance for recovery.

Mrs. GRIFFITHS. Mr. Chairman, I would like to ask a question.

Mr. HOLIFIELD. Yes.

Mrs. GRIFFITHS. Would these people be subjected to additional damage if they were to walk or ride away from a space that has been bombed? If they are still able to do so, and they walk or ride a distance of 15 miles, are they subjected to additional injury?

Dr. DUNHAM. This does not help them. In the experience with the Japanese, certain troops, as I recall the story, survived the immediate effects, I believe at Hiroshima, went on forced marches for a period of a couple of weeks and at the end of about 3 weeks they became very, very severely ill with radiation injury and most of them died. That is why we feel that any unnecessary strain or physical exercise or exertion is undesirable. On the other hand, one has to be practical under a disaster situation and many people with 100 and 200 roentgens can go about their business without any outward symptoms of fatigue and not get into trouble.

Mrs. GRIFFITHS. Then, under those circumstances, do you not think it is better that the population be trained to remain in a place of safety? If they are within a shelter or could get to a shelter immediately, would not that be better than to try to get out of it and to a doctor?

Dr. DUNHAM. If they had no other injury, this would obviously be a sensible thing to do, particularly if we are dealing with a fallout type of situation where they would increase their radiation exposure if they were to go outside.

Mr. HOLIFIELD. Isn't it true that it is inevitable that we deal with a fallout problem in case of megaton explosions?

Dr. DUNHAM. I think this is very likely. There might be situations where for strategic purposes they did not want to contaminate an

area. They might want to destroy it physically with the idea they might move their own people in shortly.

Mrs. GRIFFITHS. Well, how would they do that? Do you drop something else?

Dr. DUNHAM. Detonate it high in the air so there is no appreciable fallout.

Mr. HOLIFIELD. At that point?

Dr. DUNHAM. Yes. Anywhere.

Mr. HOLIFIELD. If you get, let us say, over 3 miles in the air with your explosion you also lose your blast effect?

Dr. DUNHAM. Very definitely. One wouldn't do that to destroy a city or land ground target.

Mr. HOLIFIELD. And your explosion of radioactive fission materials is still in the troposphere and still subject to wind currents and distribution over a wide area of the country?

Dr. DUNHAM. With a megaton type of weapon detonated a mile or more above the ground so the fireball does not touch the ground, one would expect all the debris and the fission products to be swept up above the troposphere and into the lower stratosphere and over the years filter down.

There will be thousands of burn cases and thousands of fractures—with megaton weapons, hundreds of thousands—lacerations, concussions, and contusions. There are numerous points in connection with the acute radiation syndrome about which we are at present ignorant.

Mr. HOLIFIELD. Why is it that in all of these statements there is a tendency to go back to the 20,000-ton bomb for comparison as to what will happen? Is it because you only have real data on those two bombs?

Dr. DUNHAM. That is right.

Mr. HOLIFIELD. Or is it an unconscious attempt to create a better impression in the minds of the people of what may occur than actually will occur because of the difference in using heavier bombs?

Dr. DUNHAM. There may be an unconscious factor there such as you suggest, but I think the reason one does not talk precisely about megaton weapons is that its effects, the number of casualties depends so much on the density of population over very large area that to talk about one city as compared with another, where the population density may taper off very rapidly, you have no meaningful comparison. Each case would have to be worked out itself.

Mr. HOLIFIELD. You take cities like Chicago, New York, and Detroit and Los Angeles, cities of that type, most of them are surrounded by pretty thickly populated suburbs.

Dr. DUNHAM. That's right.

Mr. HOLIFIELD. And it seems to me that the general density of population might be pretty close to the same.

Dr. DUNHAM. It is in those cities out for a number of miles.

Mr. HOLIFIELD. I notice you interpolated, and rightly I think, some words in that statement where you said there would be thousands of burn cases and thousands of fractures, lacerations, concussions, and contusions, and then you interpolated that there would be hundreds of thousands in the case of megaton weapons.

Dr. DUNHAM. Very definitely.

Mr. HOLIFIELD. That is why I asked you the question. I noticed the tendency in a lot of these statements to try to put a hopeful case or to minimize the facts which we know.

Dr. DUNHAM. Your point is very well taken, Mr. Chairman.

Mr. HOLIFIELD. I am not accusing anyone of doing it deliberately to deceive the people, but I have noticed that tendency.

Dr. DUNHAM. Yes.

Mr. HOLIFIELD. While we do appreciate the fact that you put an interpolation in there, I think the 20,000-ton weapon is very obsolete in terms of the problem of deliverability. If a nation is going to come across the oceans to deliver a bomb, they are not going to carry 20,000 kiloton bombs. They will carry megaton bombs because of the great difficulty of delivery and the waste that would be involved if they carried smaller bombs.

Dr. DUNHAM. Yes.

Mr. HOLIFIELD. So I think we have to, in this case, gear our thinking to the realities of a potential attack rather than to indulge in dreaming of what happened 10 years ago.

Dr. DUNHAM. Yes.

Mr. RIEHLMAN. Might we ask at that point, Mr. Chairman, the doctor to comment on how well he feels we would be able from the medical side to cope with such a situation as he has outlined here?

Dr. DUNHAM. That depends entirely upon the degree of organization and training of the medical and the medical aid people in the surrounding communities.

Mr. RIEHLMAN. Do we have such a program in being at this time?

Dr. DUNHAM. I think in certain areas there are fairly well-developed programs, in other areas I know of none. It is very uneven.

Mr. HOLIFIELD. What area do you know of where there is an adequate training program coupled with adequate shelter program to minimize the injuries to the point where local people can take care of the situation?

Dr. DUNHAM. I am not aware of an area where there is a really adequate shelter program. I think in the greater Boston area and the general environment there, including some of the other New England States, that there is a great deal of organized effort for back up to disasters in a large city. I am not familiar with what the state is around New York City. I know they have done a lot of work and I would not be surprised if they did not have a pretty well-developed program.

Mr. HOLIFIELD. We are going into some of these target areas after we conclude our Washington hearings and we are going to explore some of these factors as to how well these urban centers are prepared to cope with this problem which it seems to us will inevitably be theirs in case of an attack, and we would like to know from any of the witnesses any story or information as to the adequate program either in terms of numbers or in terms of acquaintance with the problem and the remedial measures that can be taken in any of our urban target area centers, if any of the witnesses know about specifically these situations.

Mrs. GRIFFITHS. Will these hundreds of thousands of casualties have to be treated under cover? It is not an open field proposition?

Dr. DUNHAM. Many of them will be minor casualties. Others will obviously have to be treated under cover.

Mrs. GRIFFITHS. How much cover?

Dr. DUNHAM. Well, the type of cover that the military gave in a field hospital. It doesn't have to be a great deal of cover but enough to keep the rain off if it is pouring rain and enough to keep the temperature consistent with a very sick person. It doesn't have to be normal room temperature, if again there are available sufficient blankets and coverings to help keep the people warm.

Mr. HOLIFIELD. But of course you are overlooking the fact that such cover is not protective at all in the case of additional fallout?

Dr. DUNHAM. That is correct.

Mr. HOLIFIELD. Tents and emergency shelters would provide no overall cover at all to radioactive fallout.

Dr. DUNHAM. Would you repeat that again, Mr. Chairman?

Mr. HOLIFIELD. Tents, cloth tents, canvas tents, such as the Army uses would provide very little protection from gamma rays contained in radioactive dust.

Dr. DUNHAM. They would provide some. I think the observations out in the Pacific in 1954 showed that the film badge reading inside of a tent that one of the weather units had on the Island of Rongerik was appreciably lower than the readings on the outside.

Mr. HOLIFIELD. Was that on beta or gamma?

Dr. DUNHAM. That is a beta-gamma combined reading.

Mr. HOLIFIELD. But wouldn't it be a true statement to say that while such a shelter might protect from beta burns——

Dr. DUNHAM. It protects entirely from beta burns if it were reasonably—reasonably constructed.

Mr. HOLIFIELD. Yes—that there would be no protection, that is no adequate or appreciable protection from gamma rays on a tent, say 10 feet high, if radioactive ash fell on the canvas cover of that tent. It would have no property of stopping the gamma rays?

Dr. DUNHAM. No, but the 10 feet of air would help some, perhaps 10 percent, 15 percent, something like that.

Mr. HOLIFIELD. When we are talking about 3 feet of dirt and 12 inches of concrete at a distance of a mile, for protection against radioactivity, we must compare that type of shielding with a canvas tent and we must, I think, not put the Pollyanna philosophy to work too much on tent protection against gamma rays.

Dr. DUNHAM. Correct.

Mrs. GRIFFITHS. How far was the tent in the Pacific from the burst?

Dr. DUNHAM. I believe that particular one was about 170 miles from the site of burst.

Mrs. GRIFFITHS. How long do you think it would take to get the population, the surviving population, 10 miles out of the city?

Dr. DUNHAM. That is a very, very serious problem. As I recall in that particular episode it was a matter of a few hours.

Mr. HOLIFIELD. This is the thing we are up against.

Dr. DUNHAM. Seven and one-half hours.

Mrs. GRIFFITHS. Ten hours afterward they were in the tents.

Dr. DUNHAM. That is, fallout came down.

Mr. HOLIFIELD. This is the point we are up against continuously in these hearings. A statement will be made which is a true statement but it is not put in proper context with the distance involved and here we have you saying before this committee in good faith and speaking truthfully that a tent would give some protection and then when we find out the tent was 160 or 180 miles away you see how meaningless your statement is to this committee when we are concerned with the lives of 60 to 70 million people in our urban areas.

It is just ridiculous to consider that you will be able to evacuate these people 160 or 180 miles.

Mr. RIEHLMAN. Mr. Chairman, I think there is another point that is very important and that is, is the doctor dealing with the atomic-energy program here all the time. Can he tell us whether or not we have medical services and supplies available in these target areas to meet with such a situation and whether or not the Atomic Energy Commission or anyone else in civil defense has made a study of the people that would be needed—I am talking about doctors and nurses—when you are talking of thousands and tens of thousands of people with broken bones and injured and burned? How will we cope with such a situation unless we have some criteria in these target areas to follow? Is there any such programing in being that you know of?

Dr. DUNHAM. There were a great many studies a few years back before megaton weapons came in. I am sure that civil defense has continued to make further studies and to revise the estimates.

Mr. RIEHLMAN. Do we know whether or not in these target areas we have medical people, doctors and nurses that would be available?

Dr. DUNHAM. I can't answer that question.

Mr. RIEHLMAN. Do you know whether any study has been made?

Dr. DUNHAM. I can't put my finger on a specific study but I am more than certain that such studies have been made by the Federal Civil Defense agency. The problem is not the doctor's in the target area itself, because maybe they won't be there.

Mr. RIEHLMAN. That's right.

Dr. DUNHAM. The problem is the doctors in the peripheral areas.

Mr. HOLIFIELD. We know they are not there. We know there is a shortage of doctors not only in our urban centers but in our——

Mr. RIEHLMAN. Then we get back to the situation, Mr. Chairman, that I was pressing a moment ago that people themselves have to know some of the things that they can do to help themselves. They cannot rely upon medical assistance at that time because it is just not going to be available in a crucial area or critical area such as he has described here where you have thousands of people who are lying injured. They are not going to be picked up by some medical group such as the Red Cross which could take care of them because they may not be available.

Mr. HOLIFIELD. I would like to explore this. I agree with my colleague. I would like to explore this subject of studies. We have studies—and I know the Atomic Energy Commission has had many, many studies, they have had constant study for 10 years on the effects of radioactivity. We have had other kinds of studies conducted by laboratories and scientists of different types, geneticists and others. Is there any need from a practical standpoint for further delay in taking some types of remedial measures for—is there any need

to delay for further studies? Don't we know enough at the present time, Dr. Dunham, to point out practical measures which can be taken?

Dr. DUNHAM. Yes.

Anything we learned behind this point would be helpful but there is no time like the present to begin——

Mr. HOLIFIELD. We know the fundamental facts of weapon yield, of density of fallout, pattern of fallout.

Is there any need for additional studies before we start doing something about it?

Mr. DUNHAM. No; I would think not.

Mr. HOLIFIELD. I am not saying that we should not have them. I think we should continue to have studies.

Dr. DUNHAM. Yes.

Mr. HOLIFIELD. But should we delay action while additional studies are carried out with the menace of a possible attack from a first-class airpower with these types of weapons?

Dr. DUNHAM. I can see no logical reason for delaying.

Mr. ROBACK. Mr. Chairman, is it possible that most of the studies that the AEC has made which contain biological and medical information are not accessible to the medical profession of this country because they are restricted?

Dr. DUNHAM. Most of the biological and medical studies which the AEC has made are available in unclassified form.

Mr. ROBACK. Well, there is a list of such studies which were submitted to the FCDA as recorded in the hearing before the Joint Committee on Atomic Energy—I don't know how many studies deal with medical and biological effects but they are classified.

Dr. DUNHAM. Right.

Mr. ROBACK. Why are these studies classified?

Dr. DUNHAM. We are preparing to get them unclassified right now. They were classified simply because they developed at a test activity and the problem is to get this material out, separated from the specific statements about the yield of the weapon, the design of the weapon, and that sort of thing.

Mr. ROBACK. Some of those studies go back to 1948; do they not?

Dr. DUNHAM. They may very well.

Mr. HOLIFIELD. We are referring to the list of weapons on page 29 of the AEC-FCDA relationship hearings by the Subcommittee on Security of the Joint Committee on Atomic Energy, March 24, 1955.

Here are some of the names of these papers: Fallout Phenomenology, Blast Injury in Foxholes, Thermal Radiation Injury, Instrumentation for Structures Program, Protective Clothing, Clothing and Personnel Decontamination, Miscellaneous Studies of Dosimeters, Exposure Containers for Biomedical Programs, Therman Effects on Animals, Radiobiology Studies at Einewetok Before and After Mike Shot. This is just one of, as it seems to me, several hundred.

Biological Effectiveness of Ionizing Radiation Within Shelters. Bacteriological Study on Animals Exposed to Neutron Variation.

Is there any reason why those papers should not be declassified and made available to the general population?

Dr. DUNHAM. I think the meat of most of those papers is already available in unclassified form.

Mr. HOLIFIELD. To the medical profession?

Dr. DUNHAM. We are talking here about the documents themselves. A large proportion of those are right now in the process of declassification. I do not have the figures. That is a list a year old, is it not?

Mr. HOLIFIELD. Yes, sir; March of 1955.

Dr. DUNHAM. March of 1955. Mr. Miller from our Civil Defense Branch can correct me if I am wrong. I believe that some 30 of those have been already declassified.

Mr. MILLER. They are in process.

Dr. DUNHAM. There is nothing that prevents them being declassified at this point. Some of them, there is a serious problem of getting them out in declassified form. But the meat of them, the information that you referred to of what we need to get a grasp of the situaion and develop a civil-defense program is out.

Mr. HOLIFIELD. That information can be made known to doctors and can be made known to nurses and to civil defense first-aid workers without any hazard to the internal security of the Nation; can't it?

Dr. DUNHAM. None whatsoever.

Mr. HOLIFIELD. So there is no need for further studies to apply these practical effects that we know and release them from the security classification; is there?

Dr. DUNHAM. None whatsoever. We could build on this sort of information immediately with what is already out.

Mr. HOLIFIELD. You could build a program which would give quite a degree of protection to the people of America on the facts that have been declassified.

Dr. DUNHAM. That is correct.

Mr. HOLIFIELD. Or could be declassified.

Dr. DUNHAM. That is correct.

Mr. ROBACK. Mr. Chairman, would Dr. Dunham care to comment—we had some discussion as to the adequacy of training of people to care for casualties—would he care to comment on the adequacy of the training of the medical profession itself to care for such casualties? How much technical and professional knowledge is actually in the medical profession in this field?

Dr. DUNHAM. There is nothing peculiar about atomic-bomb casualties. The problems that arise medically are identical with ones with which the medical profession is coping all the time—the burns, the blast injuries, and even the radiation injury is so similar to what the physician finds in treating aplastic anemia, cases of leukemia, and other diseases where a great deal of radiation has to be given as treatment, or blood idiosyncracies to drugs where the bone marrow ceases to function, that there is abundant experience on how to treat this situation in the medical profession.

Mr. ROBACK. Is it widespread or specialized knowledge?

Dr. DUNHAM. Every medical student learns these things when he is in medical school. If he becomes a superspecialist, say as an ophthalmologist he may not have much contact with this for a long time. The internist and the surgeon and general practitioner are continually familiar with this sort of thing.

Mr. RIEHLMAN. I wonder if we might ask the doctor, what free flow of information there is from the Atomic Energy Commission to Federal Civil Defense in respect to these papers that the chairman has

been discussing here. Where certain information is available and you people have it available and you know exactly what the effects are, how freely is that information passed on to the Federal Civil Defense? Are there any restrictions?

Dr. DUNHAM. Mr. Miller, all those documents have been made available to civil defense; have they not?

Mr. MILLER. That is correct.

Mr. RIEHLMAN. If that is true, there is no need for FCDA to look for much more information about the effects of these different types of hazards that our people are going to be faced with by an atomic attack.

Dr. DUNHAM. This is sufficient information for them to build on. As I indicated any future information that might be developed by that might make the situation easier rather than more difficult.

Mr. RIEHLMAN. Then we must understand as a committee that there is no restriction on any of this information being passed on to FCDA of your own knowledge and Mr. Miller's knowledge. It has been passed on to them and they have had this information available.

Dr. DUNHAM. That is correct.

Mrs. GRIFFITHS. Doctor, has any survey ever been made of how many doctors there are in this country in urban areas as compared with rural areas?

Dr. DUNHAM. The Brookings Institute made quite a survey about 3 years ago I believe. I don't recall what the results were but they made a very extensive survey of the availability of medical care and where it was.

Mrs. GRIFFITHS. In one of these attacks are not we really relying on the doctors in the rural areas to come into these areas?

Dr. DUNHAM. Or a nearby city that is without the fallout and bombed area. It would be both.

Mrs. GRIFFITHS. Then are doctors alerted to this situation? Is there any plan whereby the doctors have been informed of procedures?

Dr. DUNHAM. That is a matter which I think I indicated earlier I have some evidence that it is being done in certain areas, but how extensive it is across the country, I am not prepared to say. I am sure that civil defense people could provide you with that information and you are going to find out I believe for yourself, on your trip. I would be very much interested to see a report of your trip, Mr. Chairman.

Mr. HOLIFIELD. It will be available to the public when we finish our hearings.

Mrs. GRIFFITHS. It is possible when the civilian population finds out how desperate the situation is they may insist upon a few more doctors.

Dr. DUNHAM. Good. There can't be too many.

Mr. HOLIFIELD. Proceed, Doctor.

Dr. DUNHAM. There are numerous points in connection with the acute radiation syndrome about which we are at present ignorant. On the other hand, we know enough so that there should be no mystery about it, no sense that unearthly forces have been at work. After all, the natural radiopotassium in our bodies is disintegrating at a rate of half a million disintegrations per minute. Furthermore, radium, and diagnostic as well as therapeutic X-rays are commonly accepted tools in the practice of medicine. In fact these things have been with us for many years now.

We now have a good idea of what the end results of moderate to heavy doses of radiation are in animals, plants, and viruses. We have a pretty good idea of what the immediate effect of ionizing radiation of various types is on the various atoms and some of the chemical systems which compose living organisms. What happens in between the time when the ionization takes place in the tissue and the end; death, cataract formation, leukemia, and whatnot, we are still in the process of learning.

Mr. HOLIFIELD. We know certain effects of radiation. We know the body cells disintegrate if the degree of radiation is extensive enough.

Dr. DUNHAM. That is correct.

Mr. HOLIFIELD. We know the cells can also be injured so leukemia results, that which is commonly called blood cancer.

Dr. DUNHAM. Yes.

Mr. HOLIFIELD. We understand that eye cataracts—and I understand that after Hiroshima some 40 percent of the individuals who survived had eye cataracts formed in later years.

Dr. DUNHAM. That is the group of survivors within a thousand meters from the center of the explosion.

Mr. HOLIFIELD. We know that the cells can be affected so they run wild and become malignant.

Dr. DUNHAM. Yes.

Mr. HOLIFIELD. We have induced by radiation cancerous growths in our experimental laboratories.

Dr. DUNHAM. Yes.

Mr. HOLIFIELD. It is probably reasonable to suppose that radiation would also induce cell malignancy in the human beings.

Dr. DUNHAM. There is no reason to think it does not. In fact the experience from Japan and with the radiologists in this country suggests that exposure to radiation of sufficient quantity will produce leukemia in a fair number of the exposed people.

Mr. HOLIFIELD. We also know that where the cell does not disintegrate, it cannot only run wild and become malignant but we also know that it has the effect of causing sterility, the inability of the cells to divide and reproduce themselves; do we not?

Dr. DUNHAM. That is correct.

Mr. HOLIFIELD. Well, in view of those effects which are known and which are not classified, can we not say that we have enough information to take such remedial steps as can be taken?

Dr. DUNHAM. Yes, very definitely.

Mr. HOLIFIELD. In your considering the menace of radiation, there are several factors, it seems to me that we must consider, one is the bomb explosion, which brings immediate and intensive radiation to those within close areas. There is also the fallout, which may come over patterns of thousands of miles. Then as we see these atomic reactors being built throughout our Nation, there comes the hazard of atomic plant eruption, such as happened at Chalk River, Canada, or even a worse type of runaway explosion.

That in itself is a matter of great concern as you know to our atomic energy committee in view of the request of industry to have the Government accept part of the insurance hazard, the liability hazard to population.

Do you have anything to say about the erection of these plants in populated areas in the present stage of the art where it is, with our lack of knowledge on what might happen in the way of involuntary explosions?

Dr. DUNHAM. I think that plants can be built so the chances of a serious incident—and by that I mean the thing really almost as it were blowing up and the fission products blown downwind just like from a small ground burst.

They can be designed so that this is a very, very remote possibility. I don't think that one can ever achieve a hundred percent foolproof device, but certainly the chances with proper design are in the realm of very remote possibility of getting into serious trouble from these.

Mr. HOLIFIELD. Do you think that with the need for electrical power and its means of satisfaction in the United States, as great as it is, that we are justified then at this point in taking this chance of atomic plant eruption?

Dr. DUNHAM. I think we are. I think we are.

Mr. HOLIFIELD. Would you recommend the methods used by Dr. George Weil—the construction of a container around these plants, probably a spherical metal type of container, so if there was a runaway it would imprison the radioactivity?

Dr. DUNHAM. This would be a very helpful safety measure.

Mr. HOLIFIELD. Would you recommend going ahead and building these plants without that type of protection?

Dr. DUNHAM. I am not enough of a reactor engineer to be able to answer your statement on that point.

Mr. HOLIFIELD. The Chalk River incident in Canada happened in an area that was quite far remote from population centers.

Dr. DUNHAM. Yes.

Mr. HOLIFIELD. Yet it caused quite a serious contamination of the environs.

Dr. DUNHAM. But nobody was appreciably injured from radiation from that.

Mr. HOLIFIELD. Wasn't that because the fission that occurred, occurred in an area where very few people existed rather than due to other points or protection, you might say or methods of protection?

Dr. DUNHAM. No, as I recall the incident, there was no important problem of people who, say, would be living in homes or houses a block or so away getting into serious trouble.

Mr. HOLIFIELD. Was that because the fission was small and the neutrons and gamma rays which were emitted were comparatively small?

Dr. DUNHAM. Of course, the structure itself was shielded from that standpoint, the only problem was the contamination from the material getting out of the reactor.

Mr. HOLIFIELD. There is another area of contamination from the disposal of atomic wastes, is there not?

Dr. DUNHAM. Yes.

Mr. HOLIFIELD. This presents quite a problem. I understand that at least some of the atomic wastes are being put in special types of containers and submerged over the Continental Shelf as a means of disposing of these wastes.

In other areas they are burying it in the ground, but we do have an appreciable problem there, you might say a tremendous problem.

Dr. DUNHAM. There is a very serious problem both economically and from a health standpoint in the handling of these radioactive wastes. We are actually not putting anything to amount to a row of beans by way of radioactive waste into the ocean at this point.

Mr. HOLIFIELD. But other nations are.

Dr. DUNHAM. Some of the other nations are. But all of our big stuff stays right on the lot. And the problem is to find enough space to contain it.

Mr. HOLIFIELD. That's right. Other nations do not have quite the geographical resources that we have for that purpose and they are using the deeper parts of the ocean, I understand.

There is also the accumulated dosage which might occur from increased occupational hazards as this building of reactors continues, is there not?

Dr. DUNHAM. That's right. Of course it only requires a small number of people to operate it.

Mr. HOLIFIELD. There is even an occupational hazard in the use of fluoroscopes and X-rays; is there not?

Dr. DUNHAM. There is a very real occupational hazard and the fact that among the radiologists the incidence of leukemia is several times that among the rest of the medical profession is proof of the fact.

Mr. HOLIFIELD. And these people who should know more about it than laymen throughout the United States, because it is a hazard which is unseen and unfelt at the time, they are not taking the precautions which they should take.

Dr. DUNHAM. I think they are taking them now. Most of these go back before the Manhattan District when people became conscious of the real hazards of radiation and the development of the use of the film badge. These were not used before the war.

Mr. HOLIFIELD. I was out at Bethesda recently and had some X-rays and fluoroscope pictures taken and I am quite sure that the radiologist that handled my case did not have a film badge on him because I questioned him about it.

Dr. DUNHAM. Was he fluoroscoping you?

Mr. HOLIFIELD. Yes.

You may proceed.

Dr. DUNHAM. The net result of ionizing radiation on human brings resolves itself into two general categories—short-term effect which is of prime interest to civil defense, and long-term effect.

The long-term effects such as cataracts, leukemia, shortened life span and genetic change, show up years after radiation has been received. The short-term effects show up in a matter of hours, and days, or weeks. These latter are the ones with which we are concerned for civil-defense purposes.

The immediate or short-term effects vary with the amount of radiation. Exposures of less than 100 r units are likely to produce little more in the way of symptoms than transient nausea during the first 24 hours after exposure.

Midlethal exposures, 300 r to 500 r, produce nausea and weakness the first 24 hours and are followed by a latent period of 7 to 12 days during which there are few if any symptoms, but following which full-blown radiation disease may appear. Higher dosages are followed in a few

hours or days, as the case may be, by vomiting, diarrhea, fever, fatal collapse, and death in a few days.

The important group then will be the ones receiving from 200 r to 500 r; they will exhibit in varying degrees the signs and symptoms of what has become known as the acute radiation syndrome.

Briefly, what happens in these persons is that there is cessation of blood formation, that is the red cells and the white cells and the blood platelets which are concerned with blood clotting; the bone marrow becomes aplastic, and no new blood platelets are formed, and the testes cease to form sperm.

Simultaneously, the body, and this is very important, loses its ability to form antibodies and other immune substances important in the control of bacterial infections.

All of the clinical symptoms except the initial nausea and vomiting, and the epilation, that is falling out of hair, which appears during the third week, can be pretty well explained on this basis, the prostration, the hemorrhagic tendency, the development of ulcerations, multiple abscesses, bloody diarrhea, general sepsis, and temporary sterility of the males.

If the individual can be tided over this 3 to 4 weeks period during which his defenses are down, he will recover. Serious complicating factors include: burns-wounds which may break open during the active phase of the illness and become infected—excessive bleeding if women menstruate at this time—pregnancy resulting frequently in spontaneous abortion.

All of these lessen the chances for recovery.

If the individual survives, all of the changes will in most cases disappear. The blood-forming organs will become first hyperactive and then return to normal. The ability of the body to form immune substances will return; the testicles will again form motile and apparently normal sperm (there has been no decrease in the birth rate of exposed as compared with nonexposed persons in Hiroshima and Nagasaki).

The ulcerations will heal and the hair will grow back with normal color and texture. As a matter of fact, from August 1945 until August 1949 essentially no permanent effects of radiation were observed among the survivors of Hiroshima and Nagasaki.

In the summer of 1949, however, cataracts were noted among some 10 survivors. Since then more than 100 certain radiation cataracts have been found at Hiroshima—nearly all among survivors who had been within a thousand meters of the hypocenter at the time of the explosion.

These cataracts resemble those found in certain cyclotron workers and are believed to be the result of neutron effects. These other possible late effects should be mentioned—genetic changes, shortening of life span and leukemia.

I would like to discuss briefly the treatment of radiation illness. The physician who is confronted with a case of severe radiation illness is going to need to exercise his best clinical judgment based on experience in the practice of medicine.

There are not, and in all likelihood will not be in the near future, any rules of thumb to guide them to tell them whom they should treat.

If little pocket dosimeters, even if reasonably accurate ones, were

available on each casualty, the physicians will still have to use their best clinical judgment.

Aside from other considerations, the great variation from individual to individual in radiation sensitivity makes this apparent.

I suspect in this room there is at least one person for whom the midlethal dose, that is one which would give him a 50–50 chance of surviving, is nearer 200 r than 400 r, and by the same token one of you might find a dose of 600 r pretty rough going but by no means fatal.

The best data available from Japan today suggests 400 r as the midlethal dose for man in general. On the other hand, certain individuals appear to have survived twice that dose. What I am talking about is total body radiation and that is what we mean.

Mr. HOLIFIELD. That is the accumulated radiation that they have had.

Dr. DUNHAM. That is the total radiation to the whole body not to a part of the body.

Shield the spleen or a fair-sized piece of bone marrow and the individual subject can take appreciably more radiation. There would be also certain circumstances under which two-thirds of the subject's body might have been effectively shielded.

There is a great deal of research going on with a view to finding more or less specific means for combating radiation illness. Much of this work is sponsored by the Atomic Energy Commission but by no means all of it. The Army, the Navy, and the USPHS are all making important contributions or sponsoring important research at independent laboratories, and I should include the Air Force here, too. I see it was left out inadvertently.

As a result of these studies we have learned of a number of mechanisms by which whole body-radiation effects can be reduced. Today, however, these observations pertain only to measures which can be used prophylactically; that is, given immediately before radiation exposure is received. In other words that is not practical from the standpoint of civil defense.

The simplest means to double the LD 50 for whole body radiation for animals is to prevent the animal from receiving whole body radiation; pulling the spleen out, putting it into a lead shield and then exposing it, the animal, to radiation.

This has been accomplished very neatly in mice, rabbits, and guinea pigs by shielding the spleen. The unshielded bone marrow shows signs of radiation injury—like in an animal that has not had its spleen shielded—for a few days after radiation but by the fourth day there are signs of regeneration and by the eighth day the marrow is actively hyperplastic. That means overactive.

Mr. HOLIFIELD. The reason for that is the spleen was shielded and the spleen is the rehabilitative organ of the body.

Dr. DUNHAM. It is one of them; that is correct.

Mr. HOLIFIELD. The most important; is it not?

Dr. DUNHAM. In the mouse it is, we are not so sure whether it is in the man.

Mr. HOLIFIELD. We have not taken a spleen out of a man yet and radiated him; have we?

Dr. DUNHAM. We have not.

Furthermore, in rabbits which have very large appendixes in proportion to body weight, shielding the appendix instead of the spleen produces the same effect.

It follows that either the nonirradiated spleen in particular and probably lymphoid tissue in general normally produces a substance which is a powerful bone marrow stimulus, or that it acts as a detoxifying agent.

To take advantage of these observations as a means of prophylaxis for large populations is not very feasible. On the other hand in certain special circumstances, spleen shielding might be practical.

Furthermore, elucidation of the mechanism of this protection may go a long way toward making possible the development of specific therapy for radiation illness.

Another procedure that can be used to double an animal's LD 50 dose is to administer, about 10 days prior to radiation, some substance which suppresses bone marrow activity. This timing is used so that the bone marrow is just beginning active regeneration from injury at the time the animal is irradiated. Some substance which suppresses the bone marrow activity and knocks it out is used and just as the bone marrow begins to regenerate, it is irradiated. The animal is apt to survive twice the dose he would have been able to survive otherwise.

Mr. HOLIFIELD. We won't be able to use these in case of enemy attack.

Dr. DUNHAM. A third procedure is to reduce the oxygen tension of the blood and the amount of oxygen available to the tissues at the time of radiation. This can be accomplished by placing the animal in an atmosphere of nitrogen instead of oxygen at the time of exposure. Likewise KCN which reduces tissue respiration in the presence of normal oxygen tension has been reported to be effective.

That is a choice poison.

Another means by which tolerance to whole body radiation may be increased in animals is by the injection of cysteine or related compounds. Large doses of this essential amino acid given immediately prior to radiation doubles the LD 50 dose for the rat.

Finally it has been observed that animals can be protected to a considerable extent by injection of bone marrow either just before or within a few hours after exposure to a lethal dose of radiation.

So much for protective agents. Needless to say at this point persons shielded by a few feet of concrete or several feet of earth will be relatively safe from the direct effects of the ionizing radiations produced by an atomic bomb.

Mr. HOLIFIELD. Without going into the medical experiments that have happened which as you say are impractical for large masses of population and for other reasons, we do have a protective shelter method to use if we would pursue that course and actually arrange for these shelters for our people.

Dr. DUNHAM. That is correct.

Mr. HOLIFIELD. And that would be the only practical remedial procedure that we could take at this time?

Dr. DUNHAM. That is correct.

It has been estimated that following an air burst from a nominal bomb up to 20 percent of casualties living after the first day will be

suffering from varying degrees of radiation injury with or without accompanying burns and traumatic injury.

This would imply some 12,000 individuals in a city where the bombed area population density was comparable to that at Hiroshima—namely 35,000 persons per square mile. For a 10 megaton burst—here I am talking about an air burst again not a ground burst—the likelihood of anyone surviving the heat and blast effects without being in a situation where he was adequately protected against radiation is very slight indeed.

In other words he would have to be in a well-built deep shelter. With a ground burst, however, where lethal fallout might cover an area of several thousand square miles as Dr. Libby has testified to you and a situation which Dr. Conkite is going to testify about from the medical standpoint, the situation is essentially reversed.

There could be many thousands of persons for whom the only hazard from the bomb would be radiation.

Many of these individuals will have received from a few roentgens to 100 or 200 r. which in most instances would not produce enough injury to require any treatment at all.

Others will have received high dosages—600 to 1,000 r. or more. Most of the latter will die regardless of what you do.

With all the drain on available medical facilities for treatment of the thousands of severe burns and traumatic injury cases, it is going to be terribly important not to waste medical supplies and overtax emergency medical facilities.

It is the patients who received something in the neighborhood of 400 r. an LD 50 dose who can profit most from the best possible care which could be available under the circumstances.

The two most specific symptoms of radiation sickness are epilation and purpura. Unfortunately epilation does not appear for a week or two and purpura—that is little hemorrhages under the skin—does not as a rule appear before the patient is obviously seriously ill. The same may be said for diarrhea and oropharngeal lesions. They do not, when due to whole body radiation injury, appear as isolated phenomena in an otherwise healthy appearing individual.

The most important symptom is vomiting on the first day. Not all persons who vomit the first day will have serious radiation injury. They may have eaten something the night before or they may vomit because of some gruesome sight they have witnessed. Nevertheless in general it can be said that few persons will show up later with serious radiation illness who did not vomit the first day.

Persons who have very severe radiation injury will be actively ill with vomiting within from 1 to 4 hours after exposure.

They will in the next 24 hours begin to exhibit other signs of injury—prostration, diarrhea, and fever. They will be dead by the end of the first week. In other words, this group of patients once symptoms begin will go progressively down hill and die. They will all have been, at the time of the explosion of a nominal bomb within three-quarters of a mile of the hypocenter of a nominal bomb. Of course, some individuals inside these areas will have been more or less effectively shielded from radiation or will have greater than average resistance to radiation.

Mr. HOLIFIELD. You used a nominal bomb again there.

Dr. DUNHAM. Right.

Mr. HOLIFIELD. Can you give us the distance from a megaton bomb in comparison to the nominal bomb in the distance you gave us?

Dr. DUNHAM. I am afraid I can't give you a precise figure.

Mr. HOLIFIELD. It would be a matter of several miles; would it not?

Dr. DUNHAM. I wouldn't think it would be much more than a mile or two.

Mrs. GRIFFITHS. Anybody beyond 2 miles with proper shelter could survive then?

Dr. DUNHAM. With the proper shelter, he could be even closer in, because the shelter would also protect against radiation. That is one of the easiest things to protect against in the shelter, the radiation. Just putting a few feet of earth on top.

Mr. HOLIFIELD. You don't mean to say that if a megaton bomb exploded that people that weren't sheltered and were in a radius say of 6 or 7 miles would be free from lethal contamination; do you?

Dr. DUNHAM. If it were an air burst.

Mr. HOLIFIELD. With no contact to the ground?

Dr. DUNHAM. That is right.

Mr. HOLIFIELD. But if it were within fireball contact of the ground, of course, this rule would not apply; would it?

Dr. DUNHAM. Definitely not.

Individuals with severe radiation injury, the second category, will have nausea and vomiting, coming on from 2 to 4 hours after the explosion lasting at most a day or two.

This will be an isolated symptom, without diarrhea, without sepsis, and without hemorrhage. By the end of 48 hours they will appear to be essentially well save for possible ease of fatigability. For the majority of these patients it may not be until 10 days to 2 weeks after exposure that they will again exhibit important symptoms—purpura, sepsis, bloody diarrhea, and oropharyngeal lesions. That is ulcers in and about the mouth.

These are the persons who will have received what for them was in the neighborhood of LD 50.

With a nominal bomb, such patients are not to be expected among persons who were more than a mile from the hypocenter of the explosion.

Again many persons in these areas will be shielded more or less effectively because of having sought shelter or because they happened to be in the basements of concrete monolithic structures and the like. Consequently, depending on the adequacy of the air-raid warning system, this pertains to both megaton bombs and nominal weapons, a lot of the third group or mild cases may occur in these areas.

As to laboratory data which would be useful in guiding treatment of radiation casualties, it is only fair to say that very few blood counts will be possible during the first 24 hours after the explosion of an atomic bomb. By the time the blood changes become fairly characteristic, after 48 hours or later, it might be possible to take advantage of them in doubtful cases.

Dr. Cronkite has stated that an absolute lymphocyte count of less than 800 per cubic millimeter 48 hours after explosure implies severe radiation exposure, and conversely that if the count is greater than 1500 per cubic millimeter one can be fairly certain that serious exposure has not occurred.

The meager data available from Japan on the usefulness of various therapeutic agents in radiation illness have been carefully analyzed by LeRoy. It gives us every reason to believe that thousands of persons suffering serious radiation injury can be saved by the intelligent use of appropriate treatment. Although no controlled studies were possible, it was observed that when group O low-titre blood was made available by United States forces, it aided the recovery of some patients.

Japanese records describe rapid defervescence and prompt healing of ulcers when penicillin became available. General mortality rates were lower in the medical-school hospitals where sulfonamides and generally better care was available than the temporary infirmaries.

The records also indicate that available hemostatic agents were useless for controlling hemorrhage.

That is vitamin K and that sort of thing.

The experimental studies in mice, and in rats, and dogs, testify to the beneficial effects of appropriate antibiotic therapy. Unfortunately there is no universal antibiotic. This experimental work indicates that the usefulness of this type of therapy is directly related to the kinds of bacteria that happen to be present in the gastrointestinal tract ready to invade the host when his normal defense mechanisms are in abeyance. It is in the second category of patients that first-class medical care will be a determining factor.

Here the doctor will have to use his best clinical judgment tempered, I fear, by certain limitations on supplies.

It is probaly not wise to start antibiotics until there are clear-cut clinical indications for their use. One could promote resistant strains of organisms. It is also not wise to give an assortment of antibiotics, even if available, just because they are at hand. It might be well to start off with penicillin or aureomycin. If all goes well, continue, some other available antibiotic should be tried and even sulfa drugs could be used if necessary.

The latter, sulfa drugs, because of their tendency to produce reduction in the white blood count are certainly not first choice for these patients. On the other hand, if the antibiotics fail or the supply runs out their use is warranted and may be lifesaving in some cases.

The treament of hemorrhage will depend on the cause. When primarily the result of erosion of blood vessels in an ulcer of the gastrointestinal tract, whole blood transfusions are indicated and of course antibiotic therapy.

When the hemorrhage is due to thrombocytopenia, that is, absence or very few platelets in the circulating blood, whole blood transfusions will tide the patient over the critical period in many instances. We cannot today separate out blood platelets and transfuse them. Someday it may be possible to stockpile platelets or platelet concentrates to help control the bleeding.

Anemia in these patients will be the result of three causes. The anemia due purely to the direct effect of radiation on red-blood-cell formation will not be important for nearly 3 weeks by which time some 20 percent of the circulating red cells will have died in the normal course of events and not have been replaced. So long as red-blood-cell formation remains in abeyance, the patient will need a unit of blood every week or 10 days.

Anemia will also result from hemorrhage, from ulcerations, and from the other causes of hemorrhage referred to above.

The only useful treatment for the anemias associated with radiation illness is transfusion. That is replacement with whole blood

Efforts should be directed toward maintaining the blood hemoglobin, that is, loss of sodium and potassium from the blood, above 10 grams per 100 milliliters.

In those patients with diarrhea and prominent gastrointestinal symptoms as well as those with severe sepsis, dehydration, and electrolyte loss may be critical. In the absence of laboratory tests—and I don't think we will have too many available immediately after an atomic disaster—the doctors will have to fall back upon the tissue turgor, by pinching the skin of the patients at the back of the hand, or looking at the state of the patient's tongue to find out what the state of hydration is. Bed rest, simple, easily digested foods with adequate protein content are indicated.

These patients do not die with strange and bizarre symptoms. They die with sepsis and hemorrhage, associated with a pancytopenia—that is, an absence of bone-marrow activity with the formation of new blood cells—and an absence of the body's normal abilities to combat infection.

Physicians have all seen patients gravely ill or dying with this sort of clinical picture though the cause may have been a drug idiosyncrasy or leukemia. They have tided some of these over the crisis by the judicious use of antibiotics, transfusions, and good general care.

I personally believe that if atomic warfare ever comes to us they, the physicians, should be able to tide many such patients over the critical stages of radiation illness.

Mr. HOLIFIELD. Thank you very much, Dr. Dunham, for your testimony. It is about the most complete testimony we have had on this subject to date and has so much meat in it I know we will want to study it and our staff and our members will want to study it.

It may be that we will have some additional questions at this time. But at this time unless there are some immediate questions we will go ahead with the next witness. Would there be any questions? I did not mean to preclude any if you want to ask them.

Mr. RIEHLMAN. I have no questions, Mr. Chairman.

Mr. HOLIFIELD. Thank you very much. We will excuse you at this time.

Thank you very much.

Our next witness is Dr. Cronkite. Dr. Cronkite, we will be glad to have you come forward. We will try to get your testimony and Dr. Mider's on the record even if we have to insert part of it because the time has been going along and some of us have to go to the floor.

STATEMENT OF DR. EUGENE P. CRONKITE, HEAD, DIVISION OF EXPERIMENTAL PATHOLOGY, MEDICAL DEPARTMENT, BROOKHAVEN NATIONAL LABORATORY, UPTON, N. Y.

Dr. CRONKITE. Chairman Holified has asked me to comment specifically on the biological effects of radioactive fallout. As a preface, I want to say I am speaking as a private citizen and not representing the Brookhaven National Laboratory, the Associated Universities, or the Atomic Energy Commission.

Furthermore, I don't want to imply that my past associates in the Department of the Navy necessarily share my views on the civil-defense problem and on fallout particularly.

Mr. HOLIFIELD. The information you are giving to this committee is based upon your personal convictions based upon the background of experience and your technical training and qualifications, is it not?

Dr. CRONKITE. Yes.

Mr. HOLIFIELD. To the best of your knowledge it is your sincere and honest testimony?

Dr. CRONKITE. It is what I personally believe based on my past experience in working with atomic bombs in the field and radiation in the laboratory.

Previous testimony before this committee by Dr. Merle Tuve and Mr. Willard Bascom, of the National Academy of Sciences. in addition to public statements by members of the Atomic Energy Commission and officials of the Federal Civil Defense Agency, Hershey's and Hachiya's books on Hiroshima, and Dr. Ralph Lapp, amply demonstrate the magnitude and horror of kiloton warfare, let alone megaton warfare, the possibility of which man must face.

The Federal and State civil-defense structures have made some progress. However, the fact remains that as a nation we are unprepared for any attack on our homeland. Possibly our unpreparedness stems from the psychologic problems posed by mass destruction of life and property. Futility engenders apathy, and the citizenry is apathetic. It will take regular, forthright stimulation of our highest leaders to combat the apathy.

With an awakennig public interest and realization that there are constructive measures that will mitagate the injury, the aroused citizenry will demand and will get the action needed to provide the financial support and enabling legislation from our Congress. Preparation will be expensive and will necessitate some sacrifice at every level of our society. I know this and I want it. I also want it known that if nuclear warfare comes I want to survive and know that my family and I will be able to get along reasonably well taking care of ourselves in the suburban area in which we live, despite fallout if we are outside the initial area of destruction. I do not fear fallout, because I know its capabilities and how to protect myself and family. If the rest of the citizenry could be so educated to appreciate the real practical hazards of fallout and how to minimize the effects, a real step forward would be made. Fallout is bad, but real significant protection can be attained by each householder without bankrupting him or the country.

In respect to the effects of fallout radiation, I might state that I was the medical officer in charge of the medical team that took care of the Marshallese and the Americans that were exposed to fallout radiation in March 1954 and am one of a group from the Medical Department, Brookhaven National Laboratory, Naval Medical Research Institute, United States Naval Radiological Defense Laboratory, Division of Biology and Medicine, Atomic Energy Commission, who are continuing the care and the study of the Marshallese.

You asked about the effects of radioactive fallout.

I shall limit myself to the effects upon man.

First, I will outline the general problems concerned with fallout and then focus my attention on the March 1954 accident which in many

ways was unique to the geographic and geologic factors that exist in the Marshall Islands.

Fallout may either be visible or invisible. It may contaminate the environment, food, water, clothing, and the skin. Fallout consists either of particles of incinerated soil on which radioactive materials are layered or of the finely divided radioactive materials themselves.

Conditions of explosion and weather determines the size of the particles, rate of fallout, size and position of fallout material.

Early fallout within an hour or so of detonation is more hazardous than fallout occurring later (4 or more hours).

In the early period radiation is delivered more rapidly; evasion is thus more difficult. Later fallout is less hazardous because natural decay provides less rapid delivery of the radiation. In addition acute biological effect is less marked as the radiation is delivered more slowly. This is not true for genetic effects where total effect is proportionate to total accumulated dose.

How does fallout material affect man? The material emanates penetrating radiation (gamma) and soft slightly penetrating radiation (beta). In addition the material can be ingested or inhaled and accordingly may be deposited in the inner organs for prolonged periods. The relative danger of these factors was well demonstrated following the accident in March 1954.

The soft slightly penetrating material can injure the skin severely when deposited directly upon the skin or when handled as has occurred accidentally in the various atomic bomb field experimentation tests.

The penetrating component injures the inner organs. The sensitivity of the organs varies considerably. Blood-forming tissues are very sensitive as is the lining of our intestinal tract. Injury of the former can produce death between 1 and 10 weeks in man as a result of destruction of the cells which make red and white blood cells, and platelets.

When red cells are not made, anemia develops as the old cells die and disappear from the circulation. Severe anemia can kill. When white cells disappear, we become more sensitive to infection because these cells normally attack invading germs. Infections under these conditions can only be controlled temporarily by modern drugs. Permanent cure depends upon recover of the blood-forming tissues. The platelets are little bodies that protect us from bleeding. When these disappear, we bleed from wounds or may bleed spontaneously into vital organs. We know all of the above can produce death because these were observed at Hiroshima and Nagasaki and also occur in other diseases of man that are familiar to all physicians.

The injury to the lining of the gastrointestinal tract can also cause death in the first 2 weeks because of the fact the intestine loses the ability to retain water and vital salts. Death occurs from the loss of these vital elements. This phase was mistaken for dysentery or cholera by the Japanese physicians who did not know at that early period that the bomb produced radiation. However, it takes more radiation to produce this injury than it does to injure the bone marrow and its blood-forming cells. Treatment of this type of injury is very unsatisfactory.

Much higher doses of radiation can injure the brain and produce very early deaths. There is no treatment for this. Even if one survived the brain injury, one has yet to face the intestinal injury and later the effects of bone marrow injury.

Whereas there is no satisfactory treatment of either the injury to the brain or the intestine, this is not of real practical importance because the probability of receiving such large doses from fallout is unlikely and in the case of the prompt radiation at the time of detonation one would be thrice killed from other factors if close enough to get these doses of radiation.

Furthermore, I wish to reiterate that the brain and intestinal injury only occur after very high doses and are mentioned in this context only for the sake of completeness and so as not to be accused of withholding unpleasant facts about radiation injury.

Injury of the blood-forming tissues is not necessarily fatal. This is attested to by the fact that many Japanese are alive today who experienced it. Furthermore, they recovered spontaneously without the use of powerful antibiotics that are now available today. Ultimate recovery is dependent upon regrowth of blood-forming tissues.

As physicians, we can only replace blood and control infection for a limited period of time to give the body a chance to regenerate its own tissues. Man has not yet learned how to stimulate regeneration of or to transplant blood-forming tissues satisfactorily from one individual to another. You may well surmise that this problem is under vigorous study at the Atomic Energy Commission and Department of Defense sponsored laboratories and also in our universities not only for the obvious practical reasons but the understanding of various cellular growth phenomena. However, in all fairness to the public it would be unjust to imply that we now have any means of curing radiation sickness. Much has been accomplished and our knowledge of radiation injury has been greatly increased but practical specific treatment is not an impossible dream of the future for man. Under certain conditions it is an accomplished fact in some animals. The gap from the laboratory to the clinic, when bridgeable, is often long and circuitous.

Let us assume that one has survived the acute radiation injury. What does the future hold? I shall not comment on genetics because I am not a geneticist. However, ovaries and testicles are very sensitive. The ethical and practical problems have been amply championed in the scientific and lay literature by the Nobel Laureate, Professor Muller, and other geneticists. I shall stick to what may happen in our lifetime.

Mr. HOLIFIELD. Would you say that Professor Muller is among the top flight geneticists in the world today?

Dr. CRONKITE. I would say he was certainly among the top flight geneticists.

Mr. HOLIFIELD. And his testimony would be reliable in this field, as reliable as we could expect?

Dr. CRONKITE. I am absolutely convinced that Professor Muller's testimony would be completely reliable from a scientific standpoint.

Mr. HOLIFIELD. You are aware that he was precluded by the AEC from reading papers on this subject at the Geneva Conference on atomic energy; are you not?

Dr. CRONKITE. I had heard of that; yes, sir.

Mr. HOLIFIELD. You may proceed.

Dr. CRONKITE. Animal experimentation has demonstrated that the following may happen:

1. Life span may be shortened—the shortening increases with dose of radiation.

2. The incidence of various types of cancer may increase and may occur earlier in life.

3. Degenerative diseases, cataracts, premature aging, etc., can occur.

4. Limited disturbances in growth of young animals.

As thinking men you will want to know the numbers.

How much shortening can one expect for every roentgen unit of exposure?

I can give these numbers to you for mice or rats, but not for man. However, there is no reason to expect man to be qualitatively different, but we cannot quantify today. Studies of the Japanese survivors obviously must continue and will give some of the answers you wish today.

What has been observed so far in human beings?

In the Japanese survivors the following has been observed:

1. Cataracts of a mild sort that so far have not impaired vision seriously.

2. Definite increased incidence of leukemia.

3. Moderate impairment in growth of the children who were exposed.

4. A questionable increased incidence of aplastic anemia.

5. Alterations in life span, degenerative diseases, etc., are being watched for, but it is too early to give a definitive answer.

6. Problems of fertility and genetics have been studied, but I shall leave this to those who are more qualified than I on the subject.

General clinical experience since the discovery of radiation has shown that uncontrolled use of X-ray or other sources will increase the incidence of leukemia and aplastic anemia in man.

In addition, local injury of the skin may result in skin ulceration and late skin cancers. Many of the pioneer physicists, chemists, and radiologists—such as Madame Curie, and now her daughter recently—have died from overexposure to radiation receiving in performing their work as a result of ignorance. Today we are well informed, and there is no longer any excuse for these tragedies, because prevention is simple.

So far I have covered the generalities of fallout, summarized radiation injury of animals and man, its treatment, and stated in a general sense what the long-term effects of radiation in man may be. This latter is predicated on animal experience since human data is inadequate or lacking.

On March 1, 1954, a large number of human beings were exposed accidentally to fallout radiation. In this case this fallout material was visible. I might say it was described by the native Marshallese as snowlike. In this case the fallout material consisted of incinerated coral; in other words more or less like slaked lime so that in a tropical atmosphere it stuck to the skin that had perspiration on it and perhaps accentuated the intensity of the injury over what might be expected in a temperature climate.

It fell on the individuals, adhered to the skin, clothing, habitations, and covered their environment. Skin burns were produced in some individuals primarily by the material in contact with the skin. In most cases the burns were superficial and healed promptly without visible effect.

There was a moderate amount of pain. Some ulcerated and healed more slowly, leaving scars which are still visible today but do not impair function. It has now been 2 years. The skin looks healthy, and so far there is no indication that these healed radiation burns will terminate in cancer. One cannot say this will not occur, but the outlook appears good today that it will not.

Early treatment of these burns was largely symptomatic—cleanliness and soothing ointments for comfort. Those burns that ulcerated and became infected responded well to the application of antibiotic ointments and injections of penicillin. In addition to the skin burns, many of the individuals had a patchy loss of hair. In all individuals except one the hair has grown back completely, it is normal in color and texture. In one elderly man there are a few areas in which the hair has not grown back in its full thickness.

The higest dose of gamma radiation received was approximately 175 r. This is sublethal. However, it did produce nausea and vomiting of short duration in about one-quarter of the exposed people. After this early symptom with exception of those who received skin burns, all the individual Marshallese felt well, ate well, and were active in play and at work. Three pregnancies continued in a normal fashion.

The blood of all the exposed Marshallese and Americans was studied systematically and marked changes were observed in the white blood cells and platelets. Anemia did not develop. The depression in blood production was adequate to produce marked depressions but not sufficient to permit spontaneous bleeding or to allow the germs normally present in their bodies to invade and produce uncontrollable infections. In a general sense these individuals were on the brink of serious trouble. It is our belief that another 50–100 r would have put the dose into the lethal range.

I am in agreement with Dr. Dunham that the lethal dose for man is probably between 350 and 450 r and that survival from 800 r is highly unlikely.

Mr. HOLIFIELD. How far were these Marshallese from point zero?

Dr. CRONKITE. They were approximately 100 nautical miles. I don't remember the precise number.

Mr. ROBACK. 350 to 400 r is the median.

Dr. CRONKITE. Yes.

Mr. ROBACK. Half the people above that range would be fatally affected?

Dr. CRONKITE. No, by definition the lethal range is that range from the minimal dose of radiation which will just produce some deaths, up to that which will produce a hundred percent deaths. The expression of a 50 percent lethal dose is that dose which will kill 50 percent of a large population. It is a quantitative definition.

Above the LD 100, roughly 800 r, no survivals are possible. Between 800 down to say roughly 225 to 250 r, the percentage of deaths will vary with the dose of radiation. Below 225 or 250, it would be highly unlikely that any human beings will die from radiation if there are no complications.

Mr. HOLIFIELD. It would be reasonable to suppose that the dose of roentgens would have been greater, the closer you got to point zero; would it not?

Dr. CRONKITE. Yes, Mr. Chairman. It would depend not only on the closeness to point zero, but the axis over which the fallout occurred. So it depends both on the angle from the axis as one gets closer to the axis that it is blown out on, and the closer one gets in. In this case, actually some of the areas that were closer to the fallout had a lower dose of radiation than did the dose of the Marshallese, because they were at a greater angle from the direction of fallout.

Mr. HOLIFIELD. In other words they were not downwind. They were off to one side?

Dr. CRONKITE. Yes.

Mr. HOLIFIELD. I had forgotten whether we had any type of measurement instruments stationed on the water between point zero and the Marshallese group.

Dr. CRONKITE. There were no instruments on the water. There were devices where the American weather personnel were on Rongerik who had film badges and dosimeter devices.

Mr. HOLIFIELD. Rongerik was how far from point zero?

Dr. CRONKITE. I do not recall these numbers precisely. 80 to 90 miles.

Mr. HOLIFIELD. I was there myself but I have forgotten the exact number.

Dr. CRONKITE. Ailinginae was closer than Rongelap and had a lesser dose of radiation.

Mr. HOLIFIELD. Yes. You may proceed, sir.

Dr. CRONKITE. We think the 50 percent lethal dose is between 350–450 r and that survival from 800 r is highly unlikely.

Recovery of the various blood elements has been slow. At 6 months neither white cells nor platelets had completely recovered. At 1 year 1 type of white cell, the ganulocyte, was nomal. At 2 years as learned from the studies recently completed all were very close to the normal range.

These individuals inhaled, ate, and drank radioactive materials without any doubt because radioactivity was detectible in their urine. A moderate dose of radiation was delivered to the thyroid by radioiodine in the fission products. The amounts of other materials were so small that long-term effects of the bones and blood formation are highly unlikely.

On the basis of these experience certain things are quite evident:

1. Very slight cover such as clothese prevent skin burns.

2. Fallout can produce serious radiation injury. We cannot ignore its existence.

3. It is possible to conceive of fallout producing skin injury without deeper radiation injury in a condition where evacuation from the area was feasible but not decontamination was possible.

4. Deep radiation injury and no skin injury because of clothes, light shelter, or decontamination but inadequate shelter for gamma radiation or unable to be evacuated.

5. One can survive in otherwise fatal radiotion intensities for a long time if provided with shelter and a food and water supply. One's basement can be made into a very satisfactory fallout shelter in most cases.

6. The degree of deep radiation injury received by the Marshallese needs no specific prophylactic treatment. This is heartening and les-

sens the terrific medical problems of nuclear warfare. Treatment is that which the complications would receive if there had been no radiation at all.

A statement such as this would be incomplete without acknowledging the fact that radiation injury will complicate and increase the danger of wounds, ordinary burns, epidemic disease, etc. Similarly radiation burns if ulcerating will increase the hazard of the depression of blood formation by providing an opening for the entrance of germs.

Mr HOLIFIELD. Thank you very much, Dr. Cronkite for that statement at this time.

We have appended to Dr. Cronkite's statement a copy of a letter which he addressed to the chairman of this subcommittee under date of February 9 in response to a questionnaire which was sent to Dr. Cronkite and other distinguished doctors and scientists. And if there is no objection, because of the value of this letter, it will be received and printed at this point in the record.

(The document referred to is as follows:)

BROOKHAVEN NATIONAL LABORATORY,
ASSOCIATED UNIVERSITIES, INC.,
Upton, Long Island, N. Y., February 9, 1956.

Hon. CHET HOLIFIELD,
House of Representatives, Washington, D. C.

MY DEAR CONGRESSMAN: As a dislocated native-born and educated Californian, I take pleasure in responding to your letter of December 19, 1955, requesting that I state my views on the national civil-defense effort. First, I wish to call to your attention the fact that my views are quite obviously colored by my background. For 12 years I was a medical officer in the United States Navy. From 1946 to 1954 I was at the Naval Medical Research Institute, Bethesda, Md., involved directly with medical research that concerned the medical effects of atomic weapons. During this period there was most satisfactory collaboration between the Division of Biology and Medicine, Atomic Energy Commission, its field activities, other service laboratories, and universities. There was a healthy and beneficial competitive spirit that was conducive to and resulted in very significant advances in medical knowledge in the laboratory and in the actual testing of nuclear devices in the field. I participated in the field as hematologist at Operation Crossroads, Bikini, 1946; project officer at Operation Greenhouse, Eniwetok, 1951, and at Operation Tumbler Snapper, Nevada, 1952; director of the biomedical program for the Atomic Energy Commission, Operation Upshot/Knothole Civil Effects Test Group, Nevada, 1953; and project officer in charge of the care and study of the human beings accidentally exposed to fallout radiation, Operation Castle, 1954. On October 1, 1954, I resigned my commission as commander (MC), USN, in order to accept an appointment in the Medical Department, Brookhaven National Laboratory, and devote full time to medical research. Presently I am a member of the following National Academy of Sciences activities that bear on civil defense: Civil defense advisory committee, the panel for study of the acute and chronic effects of radiation on man, and chairman of the subpanel for study of acute and chronic effects on the blood. More need not be said to establish my interest, associations, and experience on medical problems concerned with civil defense. In my definitive comments I shall try to limit myself to the medical side of civil defense as much as possible. First, however, I shall commence with a generality.

The men who are concerned with the problems of civil defense are dedicated, conscientious men who are trying to grope with a problem the magnitude of which staggers, the horror frightens and without deluding ourselves there is no satisfactory solution. Both our allies and the enemy, although submitted to great punishment and deprivation, staggered along, adjusted and remained relatively cohesive until final defeat. The total destruction wrought in all of the World War II can now be performed in a single day. In the past when the injury was received in increments there was time to recoil, readjust, redistribute, reorganize and carry on. There were always untouched areas and people upon

whom one could depend. This potential reservoir has shrunk and will be inadequate. The less injured will have to succor the more severly hurt whether it be direct bodily injury or destroyed services and communications. All of this is of course common knowledge to you. I emphasize it because I believe the major general problem of civil defense is psychological. When one finally perceives the total problem in all its horror and magnitude, one instinctively recoils and subconsciously rejects reality. Therefore, the major needs of civil defense are realism, stability, the dignity of permanent appointments of the highest caliber and so forth.

In this connection, I read with great interest the bills which you enclosed. In my opinion, the enactment of this or comparable legislation is essential to further advancement in civil defense. As a reading citizen, without being able to prove it, I have the feeling that FCDA is a stepchild in the Federal structure, possibly a substitute for the old postal appointments. I believe the existing FCDA lacks adequate authority or status to accomplish its objectives. I don't see how it can function properly until it is on an equal level with the DOD and the AEC. Lastly, I firmly believe that civil defense is a Federal responsibility, not a State or local problem.

Interested and devoted citizens of all walks of life are critically viewing civil defense and the implications of mass destruction of people and services. The lawyer views with alarm the chaos that will be produced in legal procedures. Constructive measures have been proposed. The sanitary engineer worries about water for consumption and waste disposal. The undertakers and embalmers know they can't cope with the problem and maintain standards. The insurance companies propose remedial measures to prevent financial and economic chaos. Road and traffic engineers visualize problems and propose solutions as all facets of society either have or can. I do not deprecate the efforts of each group nor minimize the importance of each. However, I suspect that each facet could utilize all remaining available manpower for their own purposes after a thermonuclear attack. The urgent need is to recognize that every service of society will have to compromise what is the best with what is practical and possible. It would appear that the first step would be to establish the permanent civil defense organization with authority commensurate with its needs. Next, an estimate should be made of probable effect of various bombing patterns on the population—dead, injured, surviving, and available manpower for total use. Next a survey should be made of the probable damage to all facets specifying plans for remedial measures for immediate survival of function indicating clearly the manpower needs for repair of each function (communications, roads, water sewage, and so forth, ad infinitum). When all the needs are clearly delineated it will be painfully evident that adequate manpower will not be available to accomplish the minimum objectives. Then the period of planning the necessary and inevitable compromise to use available manpower will indicate how far one must reduce current standards of public services in order to survive after a nuclear attack.

Since reduction of standards of public services automatically increases the probability of epidemic disease, public health and medical services will have an additional responsibility at the time of maximum need for the care of the injured. Factors that may reduce available manpower are critical to survival. Since medical and public health services may in large part determine the size of the available manpower pool, medical and public health planning will occupy a critical position in civil defense planning and ultimate execution of any plans. Philosophic and ethical professional problems are involved in addition to practical logistic considerations. In my opinion, American medicine is willing but unprepared and organizationally unable to cope with the problems locally, let alone cross State lines. The problem is Federal, not local. It is the Nation's responsibility.

Our people and troops in particular have become accustomed to a very high level of medical care under all conditions to which they have been exposed, and they justly expect it. We can be proud of the accomplishments of medical science. Military medical history shows that there has been a progressive decrease in death rate from disease and injury with the growth and development of medical science and services. The records clearly indicate that from the Crimean War through the American Civil War, Spanish-American War, World War I, Spanish Civil War, World War II, and Korean war that progress has been consistent so that the salvage rate has almost reached an irreducible minimum in the Korean war. Such elegance in medical care will not be possible following a nuclear bombing. Medicine today does a superb job of care of the

injured. Following compound fractures life and limb are saved today with good function. The harrowing experiences of our American Civil War are forgotten where life was saved without limb. Quickie amputations with inadequate or no anesthesia was the rule for both Union and Confederates. As a people we have forgotten this phase of our history. But will we be better off after a nuclear attack? For one compound fracture or wide area burn today it takes a medical team to give adequate care. Simple arithmetic demonstrates the complete impossibility of medicine to cope with the problem and maintain standards. I do not wish to dwell further on this painful and unpleasant subject, but the public should be informed and prepared to see the sick and injured receiving only minimal or no highly skilled care. Nothing is more conducive to fear, panic, and confusion than to be misinformed and feel neglected. Practical care of mass casualties is under study by the armed services. These studies clearly indicate that the quality of medical care will have to be decreased drastically in order to be of any widespread value. I do not know of comparable studies for the civil population nor do I know of the existence of any nationwide, well organized civilian disaster medical plan. What is satisfactory for the armed services will not work with independent unorganized civilian practitioners. I attended and spoke at the last meeting of the civil defense council of the American Medical Association. Their objectives are fine, but it is completely unrealistic and ridiculous to try to solve the complex medical problems of civil defense by voluntary unpaid services of overworked private practitioners. Their intentions are of the best, but they do not have the time. I do not question for a moment that after the fact that the medical, nursing, and technical components of health services will respond as they always have, but in the early period in a highly disorganized and ineffectual manner when confronted with mass casualties. A permanent, dedicated experienced medical division of civil defense is needed now to plan and organize decentralized medical services prior to an attack. Needs for medical services have been considered by many activities but much is yet to be done in the planning stage and to be integrated into a cohesive plan. For example, the following are needed now:

(*a*) Location of every physician, nurse, and technician that is or is not practicing their profession.

(*b*) Establishment of a mobilization plan for all of civil medicine.

(*c*) Enactment of legislation to authorize issuance of orders to civil medical personnel prior to another war. I can't see anything short of total mobilization as being of any use and the plans and orders must be issued and understood before the act.

(*d*) Designation of equipment and drugs for stockpiling.

(*f*) Revision of concept of nonprofessional first-aid care with establishment of principles and technique of care of the severely injured by nonprofessional people. There are not enough physicians.

(*g*) Establishment of training program for self and family care—perhaps through the Boy and Girl Scouts, churches, etc., in addition to existing Red Cross courses.

(*h*) Establish and stockpile emergency survival rations, kits, techniques, etc., so masses of displaced people can survive on the countryside by themselves.

The medical problems are really self-evident and much more numerous than the ones I've listed. I realize that much of what is needed is impossible under our existing laws and as such would necessitate legislation. Furthermore, some of the ideas will be repugnant to many because of the necessity for Federal organization and control prior to the act. More knowledge and thought is necessary both by medicine and Government.

I have also given thought to areas in which research in the laboratory and in testing of atomic weapons appears needed. For example, there is need for a nonaddicting painkiller. Current laws would make it impossible to distribute and make accessible morphine and comparable drugs beforehand so that they will be available when needed by nonprofessional civil defense workers. If legislation permitted the distribution, the misuse of the habit-forming drugs would result. The development of a non-habit-forming painkiller may be impossible, but nevertheless should be investigated.

More information is also needed on the effect of complex geometries of underground shelters on the effect of airblast on animals under diverse conditions in order to design and build better shelters for conditions where shelters are needed. In addition, our knowledge of the human lethal dose of prompt gamma radiation and gamma radiation from fallout material is inadequate. The above

problems can in part be answered by further biological and physical studies in the field. However, the biological complexities would necessitate a shot of a device of well-known characteristics at a time and place determined by the needs of the biological studies.

Prior to the clear-cut demonstration of fallout and the resulting radiation injury on a large scale, I was not much impressed by the practical necessity of more knowledge on radiation injury. Today we are faced with the possibility of large-scale radiation injury and despite the extensive knowledge that has accumulated are unable to do anything that is specific.[1] The outlook for specific therapy is not good today. Experimentally it has been shown that radiation hemorrhage and infection can in part be controlled and radiation injury in animals prevented by appropriate preirradiation measures. However, these studies are strictly in the laboratory stage and have not progressed to the level of human clinical investigation and trial. Although nothing of practical value is now available for the specific therapy of acute radiation injury, it is urged that further research be pursued on the fundamental defects produced by ionizing radiation on mammalian systems. Medical experience has shown that rationale therapy is only developed when the basic physiologic defects are understood. Accordingly, further research is needed. Today it would be unfair to the public to imply that an effective radiation antidote can be expected in the near future or indeed that overwhelming doses are ever likely to yield to therapy. A "crash type" research program will not obtain the desired results. It is my firm conviction that deliberate thoughtful work by established investigators and by those who may care to enter the field voluntarily by reason of intellectual curiosity will be most effective in obtaining results. Toward this end liberal support of medical research on radiation effects is urged.

Much of today's civil defense thinking is molded after military thinking and custom that thinks in terms of utilizing the fertile young man as the fighting man. Since survival and the future of mankind is as important philosophically and ethically as the immediate survival of our country one cannot escape certain considerations on the utilization of manpower. For example, I can conceive that certain rescue operations and civil defense functions will involve exposure to rather large amounts of radiation. Our thinking should recognize that the fertile young man should be spared. This should be the duty of those who have passed the age of conceiving. I comment on this because I think we must consider the entire picture and I wish to introduce these considerations to the thinking laity as well as the scientific public who already are aware and undecided about the level of radiation exposure that will constitute a real genetic hazard to mankind.

Much has been learned in field tests in the past and much is to be learned in the future tests that will be of great value in planning for civil defense. The need for classification and security measures until it has been been ascertained that national security is not endangered is evident. However, personally it was a very difficult and a very trying experience to get data declassified. It is my belief that material is not declassified and made available unless the author initiates a rewrite of the classified reports and requests declassification. Unless the author desires, for reasons of scientific prestige, to initiate the rewrite and have data published in the open scientific literature the material will in general remain in the classified files. Simply making results, numbers, etc., available is inadequate. The scientist needs the entire report, shorn of classified material in order to judge for himself the reliability and applicability of information. Since no one is sufficiently astute to determine on a priori grounds what information is going to be useful for planning further experimental work or for application in civil defense, it would appear that methods for widespread declassification of weapons test information should be explored. In my opinion it is not the responsibility of the author but of the several Government agencies concerned. To my knowledge, there is no concerted effort to make the extensive information available, to interested parties, that exists in classified files, although a great part of it no longer needs to be classified particularly in the areas that bear on civil defense. May I reiterate that it is not the responsibility of the individual who did the work, but of the agency who sponsored the work. The individual's responsibility I believe ended with acceptance of his report on work completed.

Warfare of ages past has been almost a personal affair of men in combat. Weapons of mass destruction and guided missiles lend an impersonal air from

[1] Specific neutralization of the radiation injury—however, much of a general supportive nature can be done.

the side of the individual who initiates the attack. However, it is no less personal to the injured civilian than hand to hand combat was to professional soldiers of the past. It is on an infinitely larger scale involving the whole spectrum of society, all ages and sexes. As such it is a very personal affair and the individual citizen badly needs reassurance. Imperfect as any plan may be, it must be federally initiated, financed, involve the entire Nation, and show concrete evidence of its existence.

Since personal injury will occur on an unprecedented scale and since ability of the Nation to survive will depend on available manpower after attack and since medical services will determine in part the size of the manpower pool after attack and since American medicine is not now organized to cope with mass disaster it is strongly urged that equal attention be given to the medical plans as is being given other phases by various operational research contracts on behalf of civil defense.

Although I have previously touched on medical history in warfare, a further comment at the risk of repetition seems indicated. Availability of superb medical care has been an important factor in morale of our fighting forces. The knowledge that care was always available was reassuring. In the past it was the rule to sacrifice limb for life on the field of battle. Today the rule has become save limb and life and get good function but this necessitates an intact medical apparatus with trained teams (surgeon, anesthetist, nurse, and technicians), ample blood, antibiotics, and so forth. Simple arithmetic proves that such will not be possible when there are a million or more casualties in a single day. The time has come when one must retreat to primitive medical care in order to save life at the expense of limb. The history of primitive medicine is not pretty reading, but this is what must be faced up to. Is military or civil medicine prepared to accept these compromises today? I think not. However, I firmly believe it is time for our troops and civil population to be informed that medical care if available at all will be primitive and then see that all are trained somehow in self, "buddy" and family care. An informed public will be less likely to panic when confronted with reality as horrible as it may be.

Many other phases of radiation effects that are pertinent to civil defense and particularly long-term results are the subject of exhaustive study by the National Academy of Sciences and United Nations and I shall not comment on these phases.

I am not happy with the manner in which I have expressed various thoughts. My ideas continue to develop and will undergo continuous revision as the ideas mature or are discarded. No one can at this time design a satisfactory civil-defense plan for medicine or any phase of society but the start must be made now in a deliberate thoughtful manner by enabling legislation in Congress. The problems are complex. More information is essential. Hence, research is needed, but a "crash type" program will not obtain the necessary data.

I am most naive and inexperienced in affairs of Government. However, I wonder whether your proposed civil-defense organization should be a part of DOD. Perhaps it would be more acceptable to the States if connected to Office of Defense Mobilization or as a separate branch of the executive branch of the Federal Government.

I realize that starts have been made on much of what I have had to write but the effort is pitifully small. I also realize that medical phases are not the most important and sole problems. However, I feel qualified to write on this phase only. In closing I realize I did not answer specifically your basic questions. My comments perhaps are more a reflection on my dissatisfaction of progress made by the existing FCDA, State organizations, and the AMA. This is not a reflection against individuals but the overall impotency of the existing organization. I hope these thoughts will be of some value to you and your committee. I shall always be available for further service if needed.

EUGENE P. CRONKITE, M. D.

Mr. HOLIFIELD. Part of that letter on page 4 makes practical suggestions for a civil-defense program in this particular field and without going into it item by item, I would say, Dr. Cronkite, that those suggestions are valuable.

It seems to me they would be the minimum suggestions which should be implemented and which to the best of my knowledge have not been implemented in any area in the Nation at this time.

Mr. ROBACK. May I ask, Mr. Chairman, does recommendation C and possibly one of the others recommend legislation which would in the event of an emergency allow a directing authority to assign doctors and physicians to any part of the country? Is that your understanding of the recommendations?

Dr. CRONKITE. That is the way I understand it, sir. I cannot personally visualize adequate care with the medical apparatus as it exists today unless the plans are made prior to the act and everybody knows what his job is to be.

Mr. HOLIFIELD. This will take Federal legislation, I believe and also implementing legislation on the State level, to do some of the things which you have proposed in your program; would it not?

Dr. CRONKITE. It would, I should think. I am very naive in the affairs of Government, Mr. Chairman, but I firmly believe these statements that I put down here.

Mr. HOLIFIELD. As a matter of lay opinion and also as a matter of judgment from the knowledge that you have at this time, what would be your evaluation of more emphasis on shelter and less on evacuation from our urban target areas?

Dr. CRONKITE. Mr. Chairman, I believe it is an extremely difficult question to which one can give a satisfactory answer. I don't think either one can be ignored. I think they both have to be considered in plans depending upon the amount of warning that would be available. I firmly agree with the statements of Governor Peterson that it is unthinkable to just deliberately leave people in an area if they know they are going to be attacked and if there is time to get them out.

But this is not a completely realistic approach either. So there must be a combination, depending upon warning time and so on, of shelter and evacuation.

Mr. HOLIFIELD. We have had testimony which seems to indicate that a combination of the two would be the most desirable measures to take, a combination of shelter as well as evacuation, recognizing the peculiarities in each urban center.

Mr. LIPSCOMB. I have a question, Mr. Chairman.

Doctor, in the first part of your statement you indicate that because of your knowledge and experience you do not fear the fallout, and you state that if the rest of the citizenry can be educated to appreciate the danger, it would go a long way toward minimizing the effects of the fallout.

Do you have any suggestions or have you given any thought to how we could go about educating our citizens to the dangers of fallout?

Dr. CRONKITE. I really don't have any practical suggestions as to how it would be done but then it would appear to me it would have to be initiated in high levels of the Government by people who are held in the greatest esteem that the full truth is being told them about the hazard and then a logical plan for their protection.

Obviously if one is going to go into shelters in their own homes and so on, it would be a considerable personal expense, possibly some sort of stimulus by kickback in the income tax or something like that, if one were to take care of themselves, might get the ball rolling. I am really very naive in this type of thing, Mr. Chairman.

I think there has to be some sort of stimulus to get the people moving. Educate, give them a plan and help them get it started. I think it is an individual basis. I don't think any plan will take care of persons unless they are prepared to take care of themselves.

Mr. LIPSCOMB. Do you know of any pamphlets or documents available to the public that state the true facts in regard to fallout?

Dr. CRONKITE. There are the public statements of the Chairman of the Commission that have been widely spread and those of Dr. Libby.

The entire problem was presented at the American Medical Association last year, at the Radiation Research Society. I am sure that the medical profession should be aware of the problems. How effective what has been said is to getting down to the level of the average citizen is, I don't know. I suspect that Federal Civil Defense must have a pamphlet on fallout, although I have not yet seen it.

They have numerous pamphlets.

Mr. HOLIFIELD. If there are no further questions, Dr. Cronkite, we thank you very much for your testimony this morning. We appreciate its frankness and excuse you at this time.

I understand that Dr. Mider who is the scientific director of the Cancer Institute at the National Institute of Health is here and that he will be willing to testify at this time.

Dr. Mider, I appreciate your appearance here this morning.

Dr. MIDER. Thank you, Mr. Chairman, it is a privilege.

STATEMENT OF DR. G. BURROUGHS MIDER, SCIENTIFIC DIRECTOR, NATIONAL CANCER INSTITUTE, NATIONAL INSTITUTES OF HEALTH, PUBLIC HEALTH SERVICE, DEPARTMENT OF HEALTH, EDUCATION, AND WELFARE

Dr. MIDER. I have come down here to talk to you about the research programs in the National Institute of Health in radiation.

However, what I have to say would in large measure merely extend the remarks that Dr. Dunham has already placed in the record. With your permission I would like to be very brief.

Mr. HOLIFIELD. Do you have a prepared statement?

Dr. MIDER. I do not. I would be glad to prepare one for the committee.

Mr. HOLIFIELD. I suggest that you just summarize briefly any points that you think need to be brought to our attention.

Dr. MIDER. Thank you. The program of the National Institutes of Health in radiation is centralized in the National Cancer Institute because we use X-rays and the emanations of radium and other isotopes as a means of effectively treating certain types of cancer. Furthermore X-rays and such emanations are capable of inducing cancer in experimental animals and in man as well. It has become important to study more about the basic mechanisms involved in the action of X-rays on biological systems and during the war a large segment of our program also was devoted to the study of total body radiation. As Dr. Dunham told you, it is practical in experimental subjects to prevent lethality from total body radiation by injecting small amounts of bone marrow into the peritonium or the blood stream of the radiated animal. If this be done within 24 hours after the X-ray dose is given the lethal effects are practically abolished. Under the best cir-

cumstances a dose of X-rays which would kill substantially all of the subjects can be made to allow all of the subjects to survive.

While the acute lethality is prevented, the long-term effects of radiation are not. These animals have a shortened life span and they have an increased frequency of certain types of tumors particularly the leukemias.

Research in this area is proceeding. It is quite possible that the mechanism involved in the marrow transfusion is the elaboration of some substance by the metabolizing cells which has important consequences in preventing damage or allowing recovery of the damaged bone marrow.

A great deal of work is being done on this not only at the National Institutes of Health but in other laboratories throughout the country. One of the important impediments to progress is a source of bone marrow from some animal larger than a mouse with which the chemist can work.

Dr. Dunham and Dr. Cronkite have also spoken about the spontaneous bleeding that occurs as a part of the radiation syndrome.

While we have not been able to study this in an animal laboratory, tangential work related to the treatment of leukemia in patients may be very pertinent. Leukemia through its action on the bone marrow produces not only anemia but leads to purpura as a result of a lowering of the blood platelets. We have found it practical to tide the patient over the period of spontaneous bleeding by transfusion of platelets.

Dr. Dunham has pointed out that this would not be a practical method on a casualty basis. Experience at the Childrens Medical Research Foundation in Boston with preserved platelets which have been frozen gives some hope that further developments along this line may provide the medical profession with better means than are now available for dealing with purpura.

Furthermore, additional work at the University of Pennsylvania on fractions prepared from platelets also gives hope that they are therapeutically effective materials which may be produced.

A great deal of our work at the National Institutes of Health deals with the treatment of cancer and in large measure is the antithesis of the reactions associated with nuclear detonations.

The necessity for measuring accurately the doses that are given to the patients in therapeutic procedures, however, has led to some work in radiation chemistry and Dr. Howard L. Andrews has recently developed a gel which incorporates in it chloralhydrate and by means of a probing electrode the transformation of that compound to hydrochloric acid can be measured, which gives us a practical measure of the dose of high intensity rays which have been administered to a given individual.

This is a form of dosimetry.

Mr. ROBACK. Does that imply that reliable dosage measurement is a professional exercise or can that be done by the individual in a shelter? That question has come up.

Dr. MIDER. I couldn't answer that, because the use to which we put it and the use in which we need it in therapeutic research is telling how much X-ray was delivered to a given point to a patient that has a cancer. Whether or not this could be developed to a practical tool carried in the pocket I wouldn't know. There are other forms of dosi-

meters I believe that should be considered and whether or not this has any particular merit in that type of thing I am not qualified to say at this time.

In addition to the work sponsored at the National Institutes of Health, the extramural program provides support for workers in university laboratories and other research institutes. A wide, far-ranging variety of programs related to radiation biology are supported in this manner.

They include clinical X-ray therapy emphasizing such things as dosimetry and evaluation of response, and the design of new equipment for delivering X-rays in therapeutic procedures.

They treat of the reaction of unicellular organisms such as bacteria, protozoa, fungi, viruses, and so forth, to ionizing radiation, both direct and indirect effects. There is a very substantial amount of research going on in the mammal, rats, mice, monkeys, and to some extent dogs; research on the neurological effects of ionizing rays, on psychological effects, on the bone marrow, transplantation of tissues, radiation sickness, and, of course, carcinogenic agents.

The use of radioactive materials as internal emitters is almost exclusively in the field of therapy and the causation of cancer.

I will be glad to answer any questions that the committee would care to pose. It must be obvious that we are not directly concerned at NIH with the effects of X-rays in a casualty situation at this time. Although I do believe that the programs currently underway are contributing basic information which may be of considerable importance in future years.

Mr. HOLIFIELD. Thank you very much for your testimony, Dr. Mider. I am sure it will be of interest to doctors and people who have these problems to contend with and will be a valuable part of our record.

Dr. MIDER. Thank you, sir.

Mr. HOLIFIELD. Any questions?

At this time I would like to place in the record an article by Dr. H. J. Muller, of the Indiana University, entitled "How Radiation Changes the Genetic Constitution."

It is an article of some 17 pages in length. It is highly technical, but I believe that, in view of the standing of Dr. Muller—his name has been mentioned today—he is a Nobel prize winner and is conceded to be one of the great authorities in the field of genetics, and because our testimony today has been along the line of radiation effects upon human tissues, cells, I think it would be pertinent to place it in the record at this point while it is something that is somewhat technical for the layman, I believe it might be a readily accessible source document for the doctors and other professional men who will have access to these hearings and be pertinent to have it in the record at this time.

So, without objection, we will have his statement on the effect of radiation on genetics placed in the record at this point.

Mr. LIPSCOMB. What is the date of the article?

Mr. HOLIFIELD. July 6, 1955; it was prepared, as I understand, for presentation at the International Conference on the Peaceful Use of Atomic Energy. As I also understand, Dr. Muller was precluded from presenting this at that time, but that it has since been released and

has been printed in a public document. So it is, I believe, wise for us to put it in the record at this point.

(The document referred to is as follows:)

INTERNATIONAL CONFERENCE ON THE PEACEFUL USES OF ATOMIC ENERGY—HOW RADIATION CHANGES THE GENETIC CONSTITUTION

(By H. J. Muller, Indiana University)

The changes in the genetic constitution produced by ionizing radiation may for convenience be classified into two major groups, namely, chromosome aberrations and point mutations.

The chromosome aberrations consist of losses and additions of whole chromosomes of chromosome parts and/or alternations, called structural changes, in the alignment of chromosome parts. Structural changes are caused by the breakage of one or more chromosomes at two or more points, followed by the junction of the fragments at their broken ends, so as to form a new arrangement, that is, a new linear sequence of their component hereditary particles or genes.[1]

Point mutations are changes confined to regions of the chromosomes so small that no loss or addition or change in arrangement of genes can be demonstrated by microscopic examinations or breeding tests. Since structural changes range from "gross" to those so minute as to be at the limit of being detectable as such, there are doubtless other cases of substantially the same kind, but below that limit of size, which become included among the point mutations. However, there is reason to infer that many of the point mutations produced in animals by radiation are not of this kind, but involve changes within the individual genes, and are therefore to be considered as "gene mutations." By this it is meant that these changes are restricted to genetic elements too small to be divided either by the process of normal hereditary recombination (crossing over) or by that of gross structural change. This seems to be true also of the great majority of the genetic differences that exist naturally between individuals of the same species, that is, they appear to have arisen as gene mutations.

CHROMOSOME ABERRATIONS

The chromosome aberrations produced by radiation in the cells of somatic tissues that replenish themselves by proliferation cause necrosis in much of the tissue descended from these cells and abnormality in much of the surviving descendant tissue. This constitutes a major source of delayed radiation damage, some of it never repaired, in the exposed individual himself. The same series of events, occurring among the immature germ cells of the exposed individual, can result in his or her partial or complete sterility. Among mature and nearly mature germ cells, especially spermatozoa, there is a much higher incidence of induction of these chromosome changes, for any given dose of radiation, than among immature germ cells or somatic cells. Recent evidence[2] confirms the inference[3] that this peculiarity depends upon the chromosomes being in a condensed (tightly spiralized) condition and that it therefore applies also to cells that are in mitosis at the time of irradiation.

Mature sperm or eggs in which chromosome aberrations (actual or potential) have been induced, function in fertilization but many of the resulting embryos die in consequence of their abnormal chromosome content. Other embryos, in which there has been gross structural change without excess or deficiency of chromosome parts, develop into normal adult individuals. However, when these seeming normals reproduce, recombination occurs between the structurally changed chromosomes derived from one parent and their normal homologues derived from the other parent. In consequence of the nonmatching linear arrangements of the genes from the two parents, about 50 percent of the germ cells now produced have excesses and/or deficiencies of chromosome content. These germ cells usually function, but give rise to embryos (of the second generation after exposure) which die in utero at an early stage.[4] This mortality of embryos tends to be repeated over an indefinitely long series of generations. For half of the surviving embryos of such a line of descent, although not themselves containing the lethal excesses or deficiencies, have the grossly changed linear arrangement of genes that, by recombination, again gives rise to these effects.

In modern human populations, there is a tendency to compensate or even overcompensate for reductions in the frequency of viable births, by purposely

See footnotes on pp. 953, 954, and 955.

increasing the number of pregnancies.[4] Hence damage of this kind, once induced, does not tend to die out rapidly but may even spread.

Fortunately, there are several factors which serve to limit the frequency with which these cases of inherited abortions are produced. One is the fact that the period spent by male germ cells in a mature or nearly mature state averages, at the very most, a few months, whereas they usually spend some 25 years or more—well over 100 times as long—as immature germ cells, relatively insusceptible to the induction of chromosome aberrations. Although the relative lengths of the corresponding periods for female germ cells are not well established the germ cells are, even when nearly mature, much less susceptible than spermatozoa to the induction of the gross aberrations that cause inherited abortion.[5] It may be concluded that more than 99 percent of the germ cells which function after a given exposure of limited duration (comprising only a few days or weeks) were at the time of that exposure in an immature stage, relatively insusceptible to the induction of chromosome aberrations. In them, aberrations of all kinds were induced with far lower frequency than point mutations.

Even in the less than 1 percent of germ cells that are exposed to radiation of beta or gamma type during their susceptible stage, gross structural changes of chromosomes will be produced at a low frequency, relatively to point mutations, unless the total dose of radiation received in that period is fairly high, of the order of a hundred or more r units. This is because the production of these aberrations requires at least two chromosome breaks, and these are usually produced independently, by the tracks of different fast particles. On accounts of being in this sense double or multiple events, these aberrations vary in their frequency according to an exponent of the dose of radiation higher than one (commonly about 1.5).[3] On the other hand, the point mutations vary as single events, according to the dose itself. Thus, as the dose is diminished, they do not drop off as fast as the structural changes do, and the latter become rare, relatively to the former.

It follows from the above considerations that inherited abortion caused by structural change is a relatively insignificant danger even in the case of a large dose of beta or gamma radiation if that has been received in small fractions of not more than a few r per month. If the amount received in any month is higher than this, however, measures should be taken to avoid this damage. These measures would consist in the prevention or avoidance of conception until the passage of several months after the high exposure. With a very high dose, however, all but the first month of this period would be sterile anyway.

When the exposure has been to alpha or neutron radiation, the production of gross structural changes tends to vary with the dose itself instead of with a higher exponent.[6] This is because both the breaks participating in such an aberration are usually produced by activations arising from the track of this same fast atomic nucleus. In consequence both of this proportionality of the frequency of structural change to dose, with this type of radiation, and of the fact that the more densely crowded activations from such radiation are actually more efficient in breaking the chromosomes, much lower doses, in reps, of neutrons or alpha rays than of gamma, beta, or X-rays give significant numbers of structural changes. Hence the rule of not reproducing within some months after exposure should be applied in the case of much lower doses when the radiation has been of these types. In order to gauge how low this limit should be placed, it should be taken into consideration that even 5 reps of neutrons, applied to spermatozoa, may be estimated to induce inherited abortion, based on gross structural change, in some one to six among every thousand viable individuals derived from these spermatozoa.[7]

The frequency of natural occurrence of gross structural changes giving inherited abortion has not been studied extensively in mammalian populations, but it is known to be low. The highest recorded figure[8] is about 6%. Among offspring from spermatozoa treated with 500 r X-rays, 25% have been reported by two observers.[9]

CHARACTERISTICS OF NATURAL POINT MUTATIONS

Among the genetic changes induced by exposure to radiation from artificial sources the point mutations are far more frequent and significant than the chromosome aberrations. Among the genetic changes that arise from natural causes (those somewhat misleadingly referred to as "spontaneous") the point mutations are still more frequent and important, as compared with the chromo-

See footnotes on pp. 953, 954, and 955.

some aberrations. Any ordinary population contains a large accumulation, or "load," of these natural point mutations, which have arisen in the course of many past generations. If any new point mutations are induced by radiation these are added to this already existing load of mutations. They thereupon become lost to view among the latter, in the sense that, with rare exceptions, the origin of any individual point mutation cannot be traced to the radiation. Thus, in order that radiation mutations may be viewed in due perspective, certain salient facts about the natural mutations should first be passed in review.

Natural point mutations occur sporadically. They are not individually controllable. Any such mutation may be thought of as resulting from an accidental ultramicroscopic encounter between a gene and some atom-group, particle, or photon to which the gene happens, under the circumstances, to be vulnerable. It is probable that, on occasion, instead of the original or 'mother-gene" becoming altered, the accident causes a mis-step in the construction of the "daughter-gene," but the effect is much the same as if the old gene had itself mutated. In either case, point-mutational changes are permanent. This implies that the changed gene tends to be very stable, as the original gene was, and that in reproducing it continues to give rise to daughter genes like itself, that is, in this case, of the new type. Thus it "copies itself" through an indefinite succession of generations.[10]

The frequency of mutations in general is influenced, however, by many conditions. Thus, cells in certain developmental stages have mutations occurring more frequently in them, in other stages less frequently.[11] There is some evidence that markedly detrimental disturbances in the cellular biochemistry, of whatever nature, tend to favor the occurrence of mutations, while the functioning of the cell within its normal range is associated with a low mutation frequency. Certain special substances, such as the mustard gas series, some organic peroxides and epoxides, an dtriazine are so conducive to mutation that they have been termed "mutagens."[12] Some of them can in fact be used to induce mutations at about as high a frequency as with radiation. When the distribution of relative frequencies of the different types of mutations induced by one mutagenic agent is compared with that induced by another, or with that of spontaneous mutations, considerable differences are often found, even though most types of mutations produced by one agent are also produced to some extent by any other, and also arise spontaneously but at a lower rate.[13]

The partial selectivity of action of mutagens does not give evidence of being of such a nature as to result in the mutations produced by a given agent, or under given conditions, being better adapted, as a group, for life in the presence of that agent, or under those conditions, than are the mutations which arise under other circumstances. That is, mutations arising independently of radiation like those produced by radiation are, so far as the organism is concerned, accidents, not adaptive responses. There is evidence indicating that the organism has, through a long period of evolution, been selected for the maintenance of biochemical operations which give it as low a frequency of "natural" mutations as can practically be attained, just as it has been also selected to react in such ways as to minimize the occurrence of other accidents.[14]

It is entirely in line with the accidental nature of natural mutations that extensive tests have agreed in showing the vast majority of them to be detrimental to the organism in its job of surviving and reproducing, just as changes accidentally introduced into any artificial mechanism are predominantly harmful to its useful operation.[15] According to the conception of evolution based on the studies of modern genetics, the whole organism has its basis in its genes. Of these there are thousands of different kinds, interacting with great nicety in the production and maintenance of the complicated organization of the given type of organism. Accordingly, by the mutation of one of these genes or another, in one way or another, any component structure or function, and in many cases combinations of these components, may become diversely altered. Yet in all except very rare cases the change will be disadvantageous, involving an impairment of function.

It is nevertheless to be inferred that all the superbly interadapted genes of any present-day organism arose through just this process of accidental natural mutation. This could take place only because of the Darwinian principle of natural selection, applying to the genes. That is, on the rare occasions when an accidental mutation did happen to effect an advantageous change, the resultant individual, just because it was aided by that mutation, tended to multiply more

See footnotes on pp. 953, 954, and 955.

than the others. By the continuance and repetition of this process, the type that had been normal became supplanted by other types, that were at least better adapted for life in certain particular environments, or in certain ways. Thus the mutant gene of the previous era became the normal gene of today, and the whole system of genes of the species tended to become ever more differentiated and highly organized. Yet at each stage the great majority of new mutations, if examined before being put through the sieve of selection, must have been detrimental to life or to reproduction, as they are today in all species studied, no matter what the degree of advancement of the species.

As important for the survival of a species as the differential multiplication of the few better adapted mutants is the reduction in number and eventual dying out, in competition with the "normal" type, of the much numerous mutants that are less fit than the normals. Since each generation supplies a fresh crop of these mutations, to be added to those inherited from earlier generations, it is obvious that without this negative selection the system of genes would undergo continued decay. Thus after a time it would become completely heterogeneous, disorganized, and degenerate.[10] In the past, only natural selection has saved it. This selection makes it practically inevitable that any detrimental mutation, no matter how small its harmful effect, will in the long run become eliminated, by tipping the scales against some descendant who carries it, causing his premature death or failure to reproduce.

However, this dying out of the unfit mutants is in most cases rather long delayed. One reason for this delay is the fact that mutant genes are in the great majority of cases heterozygous, that is, present in individuals which have received the corresponding normal gene from their other parent, and that in such a situation the normal gene usually produces most of the effect. The normal gene is for this reason said to be "dominant," and the mutant gene "recessive," even though the mutant is seldom completely without expression when heterozygous.

Another reason for the delay in the dying out of mutant genes lies in the fact that even in those relatively rare individuals which are "homozygous" for a given mutant gene, by reason of having inherited that same gene from both parents, the amount of abnormality is often not very great. Hence even in this situation the gene usually confers a much less than 100% risk of premature death, or of failure to reproduce. It may be noted in this connection that the idea that most mutations are monstrosities or freaks is a popular misconception. In fact, only a tiny minority of mutations causes very conspicuous visible abnormalities.

CALCULATION OF NATURAL MUTATIONS PRESENT IN A POPULATION

The total number of point mutations (or, more correctly, of point-mutant genetic conditions) present in any population at a given time is a product of two interacting numerical factors. The first factor, *a*, is the total number of new point mutations that arise in one generation. The second factor, *b*, to be multiplied by the first, is termed the persistence. It represents the total number of individuals of successive generations by whom, on the average, any given mutation, present at first in one individual, comes to be inherited.[15] This same relation holds for mutations of any particular type as well as for the totality of mutations.

Obviously *b*, the persistence, depends upon the ability of the individuals carrying the mutation to live and breed, as compared with normal individuals. If for simplicity we assume the whole population to be of stable size, then *b*, for the average mutation, or for any given type of mutation, is the reciprocal of *c*, the average chance that an individual who has inherited it will be killed prematurely, or will fail to reproduce, as a result of the one or more functional impairments occasioned in him by that mutation. In getting this average chance of elimination, *c*, we must estimate the relative frequencies of individuals heterozygous and homozygous for the mutation, and multiply the chance of elimination of each of these types, taken separately, by its relative frequency. When this is done it is found that usually, despite the much smaller detrimental effect in the heterozygous individuals, their relatively large numbers cause most of the eliminations, and most of the total genetic damage to the population, to occur in this group. Thus, in most cases, the homozygous group can for practical purposes be ignored.[15]

See footnotes on pp. 953, 954, and 955.

In order to apply this method of calculation to human populations we must first have estimates of a and b. At present such estimates are very indirect, and serve only to indicate a broad range, within which, somewhere, the actual value is probably located. The fruitfly *Drosophila* has thus far been the only organism in which anything like a direct approach has been made to an observed value for either a or b, and even here the results are subject to very large errors. In this material it can be estimated that, in a population of a hundred million, a, the number of new mutations arising naturally per generation that become transmitted to the next generation, is on the average at least eight million, and that b, the persistence or average number of individuals of successive generations which finally come to inherit any given mutation, is considerably more than 20 and probably more than 40. This makes ab, the number of mutations carried by the population of a hundred million in any given generation, probably more than 320,000,000, that is, probably more than three per individual.

The estimate of a for *Drosophila* was obtained by first taking the observed frequency, 0.18%, with which "recessive" fully lethal mutations (those that invariably kill homozygous individuals) usually arise in the X chromosome per germ cell per generation when no mutagenic treatment is used.[11] This figure was then multiplied by 6, the ratio of recessive lethans in all the chromosomes to those in the X chromosome. This figure had to be obtained from experiments in which radiation was applied to spermatozoa.[10] The product, 1.08%, representing all lethals, was in turn multiplied by 4, the ratio which all mutations detrimental enough to have been detected by a given technique were found to bear to fully lethal mutations. This figure 4 also was based on radiation mutations.[17] Finally, the second product, 4.3% was multiplied by 2, because each individual results from two germ cells, and the resultant per cent, 8.6, was multiplied by 100,000,000, the number assumed to exist in the population.

That the application of the ratio 6, derived from radiation work, to natural mutations is legitimate has been shown by special tests. However, among natural mutations as a group, the ratio of all mutations to lethals is probably a good deal higher than 4, the ratio found among mutations produced by irradiating spermatozoa. For the radiation mutations include a greater proportion of structural changes and these are more often lethal. This is one reason why the final figure for a is very conservative. The other reason is that the methods of detection used failed to find mutations that produced less than about 10% risk of premature death, even if they caused considerable infertility, and such mutations may have been relatively numerous.

The figure for b is based on tests, carried out independently by two groups of investigators,[11,18] to determine how much risk of premature death is conferred by a "recessive" lethal mutation when it is heterozygous. In both cases an average figure of about 3% to 5% risk of death was obtained. This would result in only one heterozygous individual among some 25 being killed and would hence allow the average lethal a persistence of 25. That is, it would tend to be passed on to some 25 individuals, on the average, before it died out. Since, however, a considerable majority of mutations are not so detrimental as to be fully lethal when homozygous, and most of them are probably not even 50% lethal when in that condition, the figure 1 in 25 (4%) for the risk of death when heterozygous must be considerably higher than that holding for the average mutation, and the persistence, being the reciprocal of this, would be considerably higher than 25. That is why 40 was used as a better guess for b, but the observed distribution of mortalities indicates that even it is likely to be too low.

Before we can convert our figure a for newly arising mutations in *Drosophila* into a corresponding figure a for man we must obtain some indication of the ratio of mutation frequency in *Drosophila* to that in man. As yet the only line of approach to this problem lies in a comparison of the frequencies, in the two species, of natural mutations that produce certain specific effects, and that may be inferred to occur at given highly limited positions in the chromosomes. Although the evidence of this kind is meager and imperfect, there is enough of it to show that in *Drosophila* a mutation of any one specific type, located in a specific chromosomal position (so as to give rise to what is technically known as an "allele" or "pseudo-allele" of some preëxisting mutation) arises, on the average, with a natural frequency of between 1 in 100,000 and 1 in 300,000 germ cells, the most likely figure being about 1 in 200,000.[19] In mice there is little published data of this kind as yet but it would indicate a figure in the range between 1 in 40,000 and 1 in 400,000 or, most likely, about 1 in 140,000.[20] In man,

See footnotes on pp. 953, 954, and 955.

an estimate of between 1 in 50,000 and 1 in 100,000 has been arrived at, on the basis of a much larger amount of data than in either mice or *Drosophila*, but the uncertainties of the methods used in man are much greater.[21] These apparent differences in mutation frequency between the three species may well correspond to the different numbers of cell divisions which take place in their respective reproductive cycles, since these numbers for flies, mice, and men are related about as 1 : 1.5 : 2. At any rate, it is likely that the average frequency of mutations of any specific type in man is higher than in *Drosophila*, probably from 2 to 4 times as high. To be conservative, we will adopt the lower figure, 2.

It is however likely that the ratio of frequencies of specific mutations in man to those in the fly would not be nearly as high as the ratio of total mutation frequencies in man to those in the fly. For man, and mammals in general, give evidence of having a more complicated organization, all told, than the fly, especially when the complications of the nervous system are taken into account. Mammals may therefore be expected to have a more complex germ plasm than flies, one in which a larger number of different kinds of mutations of specific types can occur. This agrees with existence of a larger amount of the genetic substance, polymerized deoxyribonucleic acid, in mammalian than in fly chromosome sets. Therefore we are in all probability obtaining a low minimal figure for *a* in man if we multiply the *Drosophila a* by only 2.

For the value of *b* in man or other mammals there is as yet little basis for a decision. The existing indications point strongly to the conclusion that natural mutations in mammals in general, including man, are, as in *Drosophila*, prevailingly recessive, yet not completely so. Moreover, they certainly include a fairly abundant group of "recessive" lethals, but it is probable that mutations having a lesser degree of detriment are more frequent than lethals. At this preliminary stage of our knowledge of the subject, then, we have little ground for using a markedly different value of *b* for mammals than for *Drosophila*.

The figure of about 6.5 is thereby arrived at as a minimal one for the content of recessive, definitely detrimental mutations (including lethals), per individual human being. In a preliminary calculation using related methods, the figure 8 was arrived at.[15] These estimates can, as recently shown by Slatis,[22] be checked in a more direct way. The method consists in observations of the frequency with which homozygous individuals, showing the more definite abnormality often associated with a homozygous mutation, appear among the offsprings of marriages between close relatives. Application of this technique has led Slatis, very tentatively as yet, to the figure 8 as the most probable present approximation to the number of natural mutations of the kind in question for which a person is, on the average, heterozygous. This method now needs to be applied on a much larger scale but the present result is enough to be reassuring, in indicating that our mode of calculation is giving figures of the right order of magnitude.

It should be emphasized that in these calculations we are dealing only with those mutations which are detrimental enough to give a "sizable" risk of genetic extinction by way of premature death, that is, one as great as about 0.5 percent in the case of the heterozygous individual, or 10 percent in the case of the homozygous one. We do not know how many mutations arise which are less harmful than this, or which cause extinction mainly by their interference with reproduction, not with life itself. However, even if there are relatively few, those few which have an average grade of detriment within the same order of magnitude as the frequency of their origination by mutation, will accumulate so as to be inordinately numerous in the population. They will provide a very considerable proportion of the superficially observable genetic variability. Moreover, the frequency of the different types of mutations of this group will differ greatly from region to region, in response to differences in the conditions of selection, as well as to random influences.

Since the frequency with which mutant genes of any given degrees of detrimental effect exist in the population at any one time is the product of *ab*, where *b* is inversely proportional to *c*, the degree of detrimental effect, it is evident that the existing mutant genes have a distribution, with respect to their harmfulness, very different from the distribution to be found on examining mutations as they arise. For, among the mutant genes as they exist in the population as compared with them at their origination, the less harmful ones are (in inverse proportion to their harmful effect) more numerous than the more harmful ones. For that very reason each slightly harmful mutation that arises tends to cause as much detriment to the population as a whole in the end as each

See footnotes on pp. 953, 954, and 955.

drastically harmful or lethal mutation does, since it compensates for its relatively small degree of harm by afflicting correspondingly more individuals. In consequence, the total amount of genetic damage done to a population by mutations is much more closely proportionate to the total frequency of mutations arising per generation (a/N, where N is the number of individuals in the population) than to the frequency of mutations existing in, the population (ab/N).[23] If a is raised or lowered, however, it may take scores of generations before its changed value becomes proportionately reflected in the altered average fitness or mutational load of the population. A similar lag occurs if b is altered, as happens when the rigor of selection is increased or decreased.

CHARACTERISTICS OF POINT MUTATIONS PRODUCED BY RADIATION

In the plant material studied by Stadler,[24] evidence was obtained, based on the intensive study of a few types of mutations, that the great majority of apparent point mutations induced by radiation probably consisted of losses of a small section of a chromosome including more than one gene, unlike what was usually true of the natural mutations. In the animal material best studied with reference to this question, that of *Drosophila*,[25] there is evidence that such "sectional deficiencies" do comprise a good deal larger proportion of the point mutations obtained by irradiation of the mature germ cells than of the point mutations arising naturally. However, the apparent point mutations produced by irradiation of immature germ cells of *Drosophila* do not include substantially more that on further analysis prove to be demonstrable "sectional deficiencies" than are found among the natural mutations. Moreover, the characteristics of the effects produced on the individual, both in *Drosophila* and mice,[26] also indicate that a large proportion of these radiation-mutations are as truly changes within the genes as are the mutations of natural origin.

In general then, in the animal material, the radiation-mutations strongly resemble the natural ones. Practically all types of natural point mutations that have been looked for in extensive irradiation experiments have been found to be produced by radiation also. Like natural mutations, of course, the great majority, although not quite all, of those produced by radiation, are detrimental. Moreover, the great majority have far less dominance (i. e., less expression in the heterozygous individual) than the normal genes from which they arose. Once arisen, the radiation mutations, like the natural ones, are permanent, reproducing themselves as such.[27]

Just which mutation is produced by radiation on a given occasion is, of course, a matter of "accident," as is true of natural mutations. However, the total frequency of the mutations produced by a given dose of radiation varies to some extent with the accompanying conditions, as in the case of natural mutations, although the conditions in question are to some extent different ones in the two cases. The conditions which influence the production of point mutations by radiation include genetic differences, differences in cell type or stage, differences in metabolic reactions, and (a category overlapping the previous one) differences caused by the application of special chemical or physical treatments.

For the most part, the same influences have been found to promote or hinder the action of radiation in causing point mutations as in causing structural changes of chromosomes. For example, chromosomes in condensed stages are more susceptible to the induction of changes of both types. Some findings of interesting differences in this respect have been reported, however. Among these are the observations that sperm cells of *Drosophila* several days prior to their release, and therefore perhaps in the spermatid stage, are much more susceptible than mature spermatozoa to the production by radiation of structural changes, but not of point mutations.[28]

In accordance with the view, first proposed by Rapoport [29] on the basis of chemical work by Frick [30] that the mutagenic action of radiation is exerted via the production of actively oxidizing radicals or molecules, it is found that radiation mutagenesis of both major types is positively correlated with the amount of free oxygen present at irradiation. Physical or chemical influences which appear directly or indirectly to increase or decrease the abundance of oxygen available for conversion into mutagenic radicals influence correspondingly the frequency of mutations produced. There is, to be sure, evidence indicating that not all the mutagenic action of radiation takes the same pathway, and that some of it may be quite unconnected with oxidation. But, however that may be, the above and other findings, by demonstrating the

See footnotes on pp. 953, 954, and 955.

conditional nature of radiation mutagenesis, constitute a disproof of the target hypothesis of such mutagenesis, at least in the simplified form in which it had sometimes been applied.[31] Moreover, these findings are of considerable practical value in having led to the working out of treatments, described in other sections of this conference,[32] which give hope of affording significant protection against the mutagenic action of radiation. The fact that certain treatments, even when given after irradiation, aid in such protection, is especially noteworthy, both from a theoretical and from a practical standpoint.

In material of varied kinds, but more especially in *Drosophila*, there is good evidence that over a considerable range of dose (in *Drosophila*, from some 50 r to more than 1,000 r, a more than twenty fold range) the frequency of point mutations (like that of chromosome breaks) is directly proportional to dose.[33] Moreover, they are independent of the timing of the dose, over an enormous range, provided cellular conditions are held constant.[34] Below 25 or 50 r the mutation frequency is so low that it has hitherto been impossible to obtain sufficient data, and above 1,000 or 2,000 r the determination of frequency may be inferred with by a selective elimination (through chromosome aberrations) of the cells that happened at irradiation to be in a more susceptible state.[35] Since, however, in the work with low doses and low time-rates of delivery of gamma radiation, the germ cells of some series were traversed by only one electron track in a period of a half hour or more, on the average, and still showed a frequency of mutations proportional to the total dose, there is reason to infer that no dose or intensity of such radiation is without its proportionate production of point mutations. Moreover, if this is true of gamma radiation it must be at least as true of radiation producing tracks more densely crowded with ionizations.

Despite the equal mutagenic efficiency of different doses and dose rates of ionizing radiation, it is not necessary to infer that a point mutation or a break is ordinarily the consequence, direct or indirect, of a single activation or even of a single ionization. For all the ionizing radiation studied has some of its ionizations produced in clusters of minute diameter. If two or more ions commonly cooperate mutagenically, however, it might be thought that this would become evident by causing the frequency of mutations to vary as the square or some higher power of the dose. Yet this would not be true if those ions had to be as near together as the ones in a natural cluster, for such close juxtaposition as this would not be brought about with appreciable frequency by raising the dose and the dose rate within toleration limits.

That such cooperation in mutagenesis does occur is indicated by recent observations to the effect that fast neutrons appear to be approximately twice as efficient as X or gamma rays in inducing point mutations in the chromosomes of *Drosophila* spermatozoa,[36] and are probably a good deal more efficient still, relative to X or gamma rays, in inducing chromosome breaks.[37] Presumably alpha rays likewise would be more efficient than X-gamma rays in these respects. One possible interpretation of this higher effectiveness of fast neutrons would be provided, on the Watson-Crick hypothesis of the structrue of the genetic material, by the doubleness of the fibres in which the rearrangements are produced, if we suppose that the occurrence of the mutation or break is much facilitated when both fibres are simultaneously affected.

The effectiveness of fast neutrons in inducing point mutations is actually higher than it appears to be, because intensive studies of given cases of these seeming point mutations have shown that in fact a considerable proportion of them involve a double or multiple effect within a very localized chromosome region.[38,39] This greater clustering of effects with neutrons than with X or gamma rays is to be expected, in view of the greater concentration of the ionizations in the tracks of the ionizing particles released by neutrons, provided that the mutational effects arise in close proximity with the activations that induce them. Since this clustering of effects causes many of them to be lost to view by reason of their proximity to each other (except when special techniques of analysis are used), the mutagenic potentiality of the fast neutrons is correspondingly underrated in most experiments. So far as genetic damage to the population is concerned, however, a double or multiple effect of the given kind adds no more to the mutational load than does a single effect. Hence for present purposes fast neutrons may be regarded as no more than twice as effective as X or gamma rays in producing point mutations.

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ESTIMATION OF THE TOTAL POINT MUTATIONAL DAMAGE FROM A GIVEN AMOUNT OF RADIATION

It has been noted that the important quantity in the determination of the total amount of genetic damage is not the amount of harm done to the individuals who have inherited the mutations in question but only the total number of these mutations. For a mutation doing less harm to an individual will, as if in compensation, be passed down to a correspondingly larger number of descendant individuals. It has also been noted that an approach to a direct estimation of the total number of mutations arising has thus far been made only in *Drosophila*, and that this calculation has involved the use of data from radiation experiments. This work can therefore be applied to the estimation of the total damage arising from a given dose.

The principles have already been explained whereby a minimum value for the total number of mutations is obtained by getting the number of lethals in the X chromosome and then multiplying this by 6, to get the number of lethals in all the chromosomes, and again by 4, to get the total number of mutations causing at least 10 percent detriment to life, when homozygous. (A correction is made in this calculation, based on certain tests, in order to estimate the number of point mutations without including the structural changes). When this calculation is carried out, using the results obtained at any given dose, the resulting number can then be expressed in terms of the total number of point mutations produced by a single r unit, by using the principle of proportionality of point-mutation frequency to dose. It is then found that this number turns out to be about 1 mutation among 2,000 germ cells per r (that is, $5 \times 10^{-4}/r$) for X or gamma rays applied in the usual way to mature spermatozoa.[40] The more important figure, representing the result of irradiation of the more prevalent stages (gonia) of immature germ cells of adult *Drosophila* is only a fourth to a half of this, according to the conditions. It is probable that there are even lower values for certain other immature stages of *Drosophila* germ cells, as for instance those in the embryonic polar cap.[41]

In order to obtain a figure for the total number of mutations produced by a given dose in mammalian material we may follow the procedure which we adopted in the calculation of natural mutations. This involved a comparison of the mutation frequencies involving particular types of mutations, located in given positions on the chromosomes, in *Drosophila* and in mammals, and then applying the ratio thus found to the figure for total mutation frequency in *Drosophila*, so as to convert it into the presumed corresponding value (a minimal one) for mammals.

Fortunately there is available for this comparison a much more reliable body of data, for both groups of organisms, than that which we had recourse to in the case of natural mutations. The average frequency of point mutations of the kind in question in *Drosophila*, based on a study of ten types ("loci"), was found to be about $1.4 \times 10^{-3}/r$ for any given type, when the radiation was applied to inactive immature germ cells (oögonia).[42] The different types seldom varied from one another in frequency by a factor of more than 2 in material abundant enough for judging this matter (that in which spermatozoa had been irradiated).

In the mammalian material, comprising irradiated spermatogonia of mice, Russell [39] has reported an average mutation frequency of about $25 \times 10^{-5}/r$, based upon seven specific types of mutations ("loci"). Here the range of variation between the different types was greater than in the above *Drosophila* material, but their mean agreed well with their mode, and four of the seven types conformed fairly closely with this mean. It is clear on comparison of the two sets of results that the susceptibilty of the mammalian material is at least an order of magnitude higher than that of the flies, the observed factorial difference in results being 18. To obtain a minimum estimate of the total frequency of mutation in the mice we must therefore multiply by 18 the figure arrived at for gonial cells of flies. (It is of no consequence that in the flies oögonia were studied and in the mice spermatogonia, since special comparisons [43] have shown these two cell types to be alike in mutagenic susceptibility, as they are expected to be). Since the figure for the gonia of flies had a lower limiting value of $1.25 \times 10^{-4}/r$ the minimum value for mice becomes $2.25 \times 10^{-3}/r$. This is the frequency for a germ cell, not for an offspring derived from two such germ cells; for the offspring it would be $4.5 \times 10^{-3}/r$.

In performing this calculation we are, as in the case of the natural mutations, assuming that the hereditary material of mammals is no more compound than

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that of flies, i. e., that there is not a greater number of different specific types of mutations in mammals than in flies, despite their seemingly more complicated organisms and their larger amount of deoxyribonucleic acid. The total frequency of mutations per r may be a good deal higher than here calculated not only because of the inadequacy of this assumption but also because weakly detrimental mutations and those mainly affecting fertility rather than individual survival have not been included. Moreover, only the lower limiting value for the somewhat variable mutation frequency of fly oogonia was used. All this emphasizes the fact that our estimate is decidedly on the "conservative" side.

At the same time, it is true that the value is one for mice, not human beings. All that can be said to this is that, so long as we lack data on an organism still closer to man, it is necessary, provisionally, to base our judgments on this result, and that, since mice are so much closer to men than flies are in almost every other important respect, it would be strange if they were not closer in their mutagenic properties as well. Moreover, the factors which might be expected to cause a significant difference in the natural mutation frequencies of mice and men— their great discrepancies in length of life, size, and number of cell generations in the reproductive cycle—would not be expected to exert significant influences on the frequency with which mutations are produced in them by radiation.

The minimum figure of 4.5×10^{-5}/r point mutations for the offspring of parents both of whom were exposed can be expressed in the form: "at least one induced point mutation per offspring, on the average, for each 220 r of exposure to both parents." From this it is evident that many of the children who were conceived by Hiroshima survivors at any time after their exposure must have contained one or more mutations induced by the radiation. Similarly, children conceived by parents both of whom have been exposed to the so-called "permissible dose" of 0.3 r per week (15 r per year) for as long as fifteen years would on the average contain at least one induced mutation. It is probable that the same is also true of the children of many radiologists, dermatologists, and dentists."[46]

The recent study of Macht and Lawrence[46] gives direct evidence of genetic damage in such cases and is in this respect superior to the studies made in Japan. Moreover, studies of Moeller *et al*,[46] show that the population in general is already receiving significant amounts of radiation from medical diagnoses. Sonnenblick[47] finds that exposures of this kind are seldom adequately controlled.

When it is considered that practically every mutation must eventually become eliminated from the population, after having—even if imperceptibly—hampered enough descendants so as to finally to be a deciding cause, in the last of the line, of his premature death or failure to reproduce, then it becomes evident that practically every mutation represents a postponed disaster. Thus the genetic damage, that to later generations, caused by a given total dose is seen to be far greater than the damage to the exposed individual himself. In view of this, measures and regulations concerned with radiation protection should be based, at least in the case of persons who may later reproduce, primarily on the risk of genetic damage or, more specifically, of point mutations in their germ cells, rather than on the risk of damage to their own bodies. This would cause such measures and regulations to be far more stringent than they are at present."[48]

THE INDUCED MUTATIONS IN RELATION TO THE NATURAL LOAD

On our conservative estimate of 16,000,000 natural mutations arising per generation in a population of 100,000,000, a frequency of .16, it would take only about 37 r of gamma radiation delivered to the population to produce a quantity of new mutations equal to the new natural ones, and thus to double the mutation frequency. Our conservative estimate, however, was based on the assumption of only 1×10^{-5} as the average frequency of a mutation of some specific type, involving a given chromosomal position. According to this assumption the actual data, which indicate about 2×10^{-5} as the frequency of mutations of a specific type, are misleadingly high, because of certain sources of technical error. Since, however, this is a matter by no means proved as yet it remains quite possible that the amount of radiation necessary to double the mutation frequency is 75 r or higher. This is approximately the value that we used in our earlier treatments of the subject,[48 49] in which it was assumed that the observed 2×10^{-5} frequency for mutations of a specific type was approximately correct. These considerations illustrate the considerable margins

See footnotes on pp. 953, 954, and 955.

of error in any present quantitative treatments, and the need for greater exactitude of knowledge."[39]

The present uncertainty regarding the natural mutation frequency carries with it a corresponding uncertainty regarding what proportion of the natural mutations in man are contributed by natural radiation. There is also uncertainty regarding this question based on variations in the amount of natural radiation. If we suppose that in some typical regions as much as 6 r are accumulated, on the average, in the span of one human reproductive generation (25 to 30 years), then, on the more conservative estimate that the natural mutation frequency is equal to what would be induced by 37 r, it turns out that some 16 percent of the natural mutations in man are produced by natural radiation. On the higher estimate for natural mutations, some 8 percent of them would be radiation-induced. In either case, the figure must be far higher than for short-lived organisms, such as mice or flies. On the other hand, in some human populations living at a high altitude, with its greater cosmic ray intensity, the contribution of radiation to the natural mutation rate must be twice as high as here estimated. Still higher values must obtain for some populations living in regions where radioactive minerals are abundant.

Many persons unfamiliar with genetics have regarded the seeming normality of the children born to survivors of the Hiroshima and Nagasaki bombings as evidence against the conclusion that the amount of radiation there received produced a significant amount of genetic damage. This misunderstanding arises from their lack of realization of the following points. (1) Few mutations are sufficiently dominant to give readily perceptible effects when inherited from only one parent, as they are in the vast majority of cases. (2) Even though these effects are not perceptible they are nearly always sufficient to hamper the individual somewhat, and finally, usually in a very distant descendant, to cause the extinction of that line of descent. (3) In any heterogeneously breeding population, such as is found anywhere outside of the geneticists' fields and laboratories, there is already so much natural genetic variation, representing an accumulation of many generations of natural mutations, that the additional mutations caused by the radiation would become lost to view among them even if they were as abundant as those that would arise naturally in the course of a number of generations. Thus, the genetically damaged population will eventually have to pay the costs, but these will be spread out over so many small installments, and so intermingled with the greater weight of other payments, as hardly to be recognizable. All this was of course well known to geneticists before the observations on the children at Hiroshima and Nagasaki were conducted, and led them to express serious doubts that any genetic effects would be demonstrable there, even though they had no doubts that they had actually been produced."[40]

These points may be better appreciated if it is realized that in *Drosophila* also it had not been possible to demonstrate the mutagenic action of radiation by mere inspection of the individuals of the first, second or third generations after exposure. Exact genetic methods had first to be worked out[50] and these are of course unavailable in man. Even following an exposure of fly spermatozoa to some 5,000 r, which we today know causes each offspring, on the average, to receive at least 3 induced mutations, hardly one abnormal offspring is usually to be found among 100 examined, yet the damage is there, and it will be exerted if the population is allowed to continue.

At the same time, it is true, unlike what many nongeneticists suppose, that the effects of the genetic damage are more strongly exerted in the first generation of offspring than in any subsequent generation. They very gradually subside, in the course of many generations, as the population is purged by the dying out of the unfit. Even the recessive effects, those present in individuals homozygous for the given mutations, are found most frequently in the first generation, and then less and less frequently if the population breeds naturally rather than being subjected to a geneticist's controlled inbreeding manipulations. Moreover, there is a much higher chance that a given induced mutation will become homozygous by meeting, at fertilization, a gene of the same type derived from the great accumulated store of natural mutations, than one of that type which, like itself, had been induced by the radiation.

Since the worst effects are already exerted in F_1, what the Hiroshima observations do demonstrate clearly is that the genetic damage to posterity caused by exposure to between one hundred and several hundred r is not *conspicuously* detrimental, and is well within limits consistent with the survival and self-

See footnotes on pp. 953, 954, and 955.

perpetuation of the population. This might have been reckoned as probable without the direct evidence. For, according to the conclusion that the average individual is already heterozygous for some 6, 8, or even more mutations which when homozygous would be fairly conspicuous and/or detrimental, it does not seem likely that the addition in heterozygous condition of just one more, induced by some 200 r, would result in any very evident change in the picture. This remains true even when we take into consideration the fact that the already existing mutations have already passed, to varying extents, through the sieve of selection and are therefore not, on the average, as detrimental as the newly induced ones.

The apparent contradiction between the fact that a really serious amount of genetic damage was produced and the fact that none is evident even in the most afflicted generation (the first), is reconciled by the manner in which the damage is spread out, thinner and thinner, over a great number of generations. There is a kind of buffering or dilution of the damaging effects, by the normal genes that dominate over them and thus delay their elimination. Thus the effects are spread out in time, in inverse proportion to their dilution in any one generation, but the total damage remains just as great as if concentrated. Moreover, even though the induced mutations may be many times the number that would arise naturally in only one generation, they are nevertheless few in relation to the accumulated natural "load." Hence they can raise by only a rather small percent the number of genetic shortcomings already present in the population.

Despite these buffering influences, it would be impossible for a population to tolerate, generation after generation, an exposure which, given to only one generation, would cause no perceptible deterioration. Gradually, as elimination rose enough to balance the new mutations, an equilibrium level of acmumulation would be approached, and at this new level the then existing accumulated load would be as many times greater than the original accumulated load as the then existing mutation rate was greater than the original mutation rate. Thus, if 37 r doubles the mutation rate, a population which had received this dose for many generations would at last have twice as many ills of genetic origin as we have. Yet we already have more than enough for comfort.

Not to be neglected in the picture is the other end of the balance mechanism: The rate at which elimination of mutations goes on. Under modern civilization we interfere so much with this that we are probably raising the load of accumulated mutations as fast as by applying some tens of r to everyone's reproductive organs.[44] Under these cirmumstances the raising of mutation frequency at the same time, by exposure to radiation, might tend to bring us to a genetic situation that it would be difficult to cope with.

All these questions need to be not only discussed but actually investigated far more realistically than they have been in the past. Otherwise we may at last find ourselves, genetically, facing a parallel to already accomplished deforestation and erosion, on an even grander scale. The problem is not only one that is concerned with the possible aftermaths of atomic war; it must be faced equally by the proponents of peace if we are to have an atomic age, with its risks of prolonged "permissible" exposures arising from industrial uses and radioactive waste products.

For peace will, we hope, go on and on through a great series of generations. Under these circumstances, it will be the more necessary to control and limit the radiation received by the population at large in every generation. For, given enough generations, the equilibrium level of damage will be reached, at which that damage will no longer be buffered, but will accurately correspond with the existing mutation frequency. Then, a relatively small number of r per generation will exert an inordinately larger effect than it seems to now. At our present juncture, before that process has more than begun, farseeing policies should be established. These must guard us against the dangerous fallacy that what cannot be seen or felt need not be bothered with.

This subject of protection of human beings against the genetic damage produced by radiation must, until suitable policies are established, far overshadow in its importance that of the utilization of radiation in the genetic improvement, for human purposes, of organisms potentially useful to man, or in the elimination or reduction of noxious organisms. However, these constructive uses of radiation in "biological engineering" will come increasingly to the fore as the more menacing aspects of radiation are brought under control. There is already abundant evidence of the possibility of such beneficial applications on a considerable scale.[21 45]

See footnotes on pp. 953, 954, and 955.

At the same time, the dangerous mistake should not be made of considering man as a species who would himself undergo a long-term benefit from the application of radiation to his germ plasm. His own reproductive material is his most valuable irretrievable possession. It is already subject to an amount of variation which, in relation to his present reproductive practices, borders on the excessive. Under these circumstances, man's first concern in dealing with radiation must be his own protection.

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Mr. HOLIFIELD. If there are no further questions, we will thank our witnesses this morning and the committee will stand adjourned.

(Whereupon at 12 : 30 p. m. the committee adjourned.)

CIVIL DEFENSE FOR NATIONAL SURVIVAL

WEDNESDAY, MARCH 28, 1956

HOUSE OF REPRESENTATIVES,
SUBCOMMITTEE ON MILITARY OPERATIONS
OF THE COMMITTEE ON GOVERNMENT OPERATIONS,
Washington, D. C.

The subcommittee met at 10:05 a. m., in room 1501, New House Office Building, Hon. Chet Holifield (chairman of the subcommittee) presiding.

Present: Representatives Holifield (chairman), Fascell, Riehlman, and Lipscomb.

Also present: Michael P. Balwan, staff director; Herbert Roback, director of investigations; Earl J. Morgan and Robert R. McElroy of the subcommittee staff; and Carey Brewer, Legislative Reference Service, Library of Congress.

Mr. HOLIFIELD. The subcommittee will be in order.

Pusuant to the responsibilities that this subcommittee has to look into the subject of civilian defense in all phases, we have arrived at the point where we plan to take testimony regarding shelters for civilians that may be able to withstand the blast of nuclear warfare and the radiation effects of that type of warfare and give the best chance of survival to the people of our Nation in case of such an event.

This morning we have before us Mr. Edward Cohen of the firm of Ammann & Whitney Corp., New York City. This firm is a leading consulting engineering firm well known for construction and contribution to reinforced concrete design. We understand that it presently has contracts with the Federal Civil Defense Administration and the Department of Defense.

Mr. Cohen will testify on the firm's work in shelters. We understand that he has been engaged in design and investigation of blast resistant construction for the Corps of Engineers, the Federal Civil Defense, the Atomic Energy Commission and the former National Security Resources Board.

Mr. Cohen, will you please come forward at this time? We will be glad to hear from you. Do you have a prepared statement?

Mr. COHEN. Yes; I have a brief statement.

STATEMENT OF EDWARD COHEN, AMMANN & WHITNEY, CONSULTING ENGINEERS, NEW YORK, N. Y.

Mr. COHEN. I just wanted to make one correction in the description of the firm.

Mr. HOLIFIELD. All right.

Mr. COHEN. It was referred to as being expert in concrete, reinforced concrete construction. We are very happy to accept that

designation, but I would also like to point out that we are not solely engaged in reinforced concrete work and that actually a major part of our work is in structural steel. Mr. Ammann, with whose work you may be familiar, is a well-known suspension bridge designer.

Mr. HOLIFIELD. We are glad to have that addition to the description of your firm.

Mr. COHEN. The statement which I have prepared is as follows:

Ammann & Whitney, consulting engineers, have been engaged in research and development work for blast-resistant structures and on the design of actual full-scale structures to resist nuclear explosions since 1949.

I have been continuously associated with this work during this period. Our structures have undergone field tests at Eniwetok in 1951 and at the Nevada testing grounds in 1953 and 1955 to within 1,000 feet of ground zero. It is our experience that above-ground structures can be designed for any required degree of blast resistance, that is, to withstand the blast pressures of an atomic explosion at any specified distance from ground zero beyond the fireball area for any size weapon. As ground zero is approached the structures become more massive and more expensive and even impractical, from the point of view of economy, at very close range. Below-ground construction then becomes necessary.

It is possible to reduce the area of severe damage to buildings by as much as 70 percent at relatively low cost if blast resistance is considered in the initial design. Although this approach is applicable only to new construction, it is an important factor in view of the magnitude of our normal construction program and the number of structures replaced annually because of obsolescence.

Contrary to popular opinion, the value of an increased general level of blast resistance becomes more important as the bomb sizes increase because the potential area of damage increases. Thus, in a large city a greater proportion of the total number of buildings will fall within the normal area of severe damage and the increased blast resistance will be more fully utilized in the case of a large bomb than a small one. In addition to raising the general level of blast resistance for buildings as a whole, shelters can be built in the basements of these buildings or other areas to protect the occupants at much closer radii from ground zero.

Blast resistance by itself is not adequate protection in large, densely built up cities where secondary fires and fire storms may cause death by suffocation and heat of those people protected from blast by shelters. It is unfortunate that the general indifference to these problems is such that at a widely attended and publicized conference on urban redevelopment last year, not one speaker discussed this problem. Although the ideal solution is dispersal, the hazards may be minimized to some extent by planning parkways to serve as fire breaks as well as access roads for fire fighting equipment and personnel and by making the fire-resistance requirements in the building codes more severe in congested areas.

However, it must be recognized that the average builder is not ready to increase his construction budget in order to obtain added blast resistance to protect his investment in the event of an attack with nuclear weapons. It must also be recognized that dispersal can be

achieved only gradually and to a limited extent without disrupting our economy and way of life. If it be decided that it is in the interest of the country as a whole to raise the general level of blast resistance, it appears that the burden of the effort will fall on the Government, perhaps in the form of an insurance program with rates varying according to the standard of the construction and the location.

That completes my prepared statement.

Mr. ROBACK. What kind of insurance are you referring to at that point? Do you mean insurance of structures?

Mr. COHEN. Yes, similar to the wartime program where structures were insured against smaller bombs and aerial attacks.

Mr. HOLIFIELD. Mr. Cohen, can you give us something a little bit more definite? You have made a general statement here, which of course the committee is glad to have, but can you give us something in the way of definite information regarding the types of construction which you have built and the amount of protection that it gives and go into this a little bit more detail?

Mr. COHEN. The first program on which we were engaged was Operation Greenhouse where our part of the work consisted in the design of a test section, of full-scale above-ground buildings, as well as an underground shelter designed for the pressures at ground zero from a 20-kiloton bomb. Various types of construction, reinforced concrete, structural steel, brick, corrugated metal, and so forth, were included in the test.

Some of the buildings were rigid frames of the normal type except that they were designed for a blast specific resistance. Others were of the shear wall and cellular construction in which type the force of the blast is transferred to walls rather than to frames. I think perhaps out in California you may be familiar with that kind of construction for earthquake resistance. Except for the underground shelter, all were 3-story buildings, some windowless, some with window openings.

They were designed by methods which at that time were an innovation for structural engineers. The effect of blast was computed by dynamic procedures and a specific degree of resistance was incorporated in the construction by limit design methods and ultimate strength theory.

In other words, they were designed to stand blast pressures at a point where normal construction would have been demolished and the amount of the damage to the structures under the given loading was predicted prior to the test. After the test we found that the predictions were quite correct, as accurate as we would want.

Mr. HOLIFIELD. How far were these structures from point zero—I am speaking now not only of the specific structures but also the ones in Nevada. Can you give us some information as to how far they were and approximately what strength the bombs were where the yield has been revealed?

Mr. COHEN. I think that with respect to the structures at Nevada that I can give the information. With respect to Greenhouse, I feel that I need some authorization for that. I don't think the information has been generally released.

Mr. HOLIFIELD. You mean to say that tests on buildings conducted at Greenhouse have not been made available to the public?

Mr. COHEN. The results of the tests as far as methods of design, determining the required strength are concerned, have been made available and we have recently published a paper in the Journal of the American Concrete Institute. That was last year. That paper covered the general method of design. However, the relationship between the bomb size, the ground zero distance, and the pressures, I understand, are still considered as restricted data. I may be incorrect but that is my impression.

Mr. HOLIFIELD. It would not be worth very much to the public unless you had a way of comparing the strength of the weapon with the distance of the building and the pounds per square inch that it withstood.

Mr. COHEN. We very definitely do have that. In other words, for any size weapon, it is possible to compute, within certain approximations as available to the general profession, the blast pressure at any distance from ground zero. There are also available methods of designing buildings to withstand those pressures, so that as far as designing structures is concerned, I think that all the information necessary is available. What is not available is the experimental proof that was obtained from Operation Greenhouse.

At the Nevada Testing Grounds, the tests of last year have been released by civil defense and as a matter of fact the construction plans for some of the test structures have been made available to the general public.

The main structure there, the heaviest one, was an underground shelter for 40 persons, which was located about 1,000 feet from ground zero and withstood a blast pressure of 100 pounds per square inch. The weapon size was in excess of 30,000 kilotons. We had also designed other structures at bigger ranges for that same test. In general, the results of that test also indicate that once the criteria, bomb size and range, have been established, we can go ahead and design structures to achieve our desired results.

Mr. HOLIFIELD. Now, have you done anything in the way of designing shelters which can be installed either in basements of homes in our populated centers or in backyards where families can have a reasonable and inexpensive but yet fairly efficient type of shelter?

Mr. COHEN. Yes, we have. We have worked with civil defense on the basement exit type shelters and certain above ground utility room shelters. We have also prepared some of the plans which I think were originally developed by Lehigh for the tests of basement shelters which primarily protect the occupant from falling debris of the house, and so forth.

Shelters of that type might be adequate with respect to blast pressures up to pressures which by themselves would injure the individual. In other words, the protection prevents him from being struck by objects which are dislodged by the blast, but gives only limited protection against blast pressures and radiation.

Mr. HOLIFIELD. What range of costs are involved in modifications of basements to provide reasonable shelter?

Mr. COHEN. Well, depending on what the location of the house is and what degree of shelter is required—I am speaking entirely with respect to blast—it would range from a nominal amount to perhaps a thousand dollars. I think that the basement-exit-type shelter might

be about a thousand dollars. And I note here that in the recent release by civil defense which included this industrial shelter for 40 people which I mentioned before, there were also included a bathroom-type shelter and an intermediate range underground shelter for 4 to 10 people. The cost figures which were given in that release are about a thousand dollars and for the underground shelter about $500 for the bathroom shelter. For a fallout shelter the cost is nominal, mostly the labor involved in putting the materials together.

Mr. HOLIFIELD. When you say bathroom shelter, what do you refer to? Do you refer to a special construction of the bathroom in any ordinary house?

Mr. COHEN. Yes. That would be involved in the initial construction. The bathroom would have the sanitary facilities available, would be constructed of reinforced concrete, and I believe that——

Mr. HOLIFIELD. Would that be a ground floor?

Mr. COHEN. Of course, it is a matter of what is practical and convenient and what sacrifices the individual can make for future protection. The shelter is most effective, of course, in the basement. But the bathroom may not be located there. The fact that this is a bathroom shelter does not necessarily mean that the shelter itself must be a bathroom. It could be an area of the basement floor, which is built of heavier construction.

We have designed a house of reinforced-concrete block with cast concrete roof and floor. This house has been publicized by the Portland Cement Association. We feel that the cost of this house would not be greater than the cost of normal construction to any appreciable extent.

A builder from New Jersey felt that, with certain modifications, the cost might be lower. In other sections of the country the reverse might be true.

The point I want to make is that this house, costing only a nominal amount more than normal construction, is able to withstand blast pressures such as occurred out at Nevada at ranges of about 4,000 feet whereas normal construction which did not consider blast resistance was demolished or severely damaged out to 7,000 feet. Since the areas involved vary as the squares of the radii, the area of damage is reduced by two-thirds by increasing the resistance at nominal cost.

Together with Lehigh University we made a similar study for civil defense in connection with multistory construction, and we have found that by considering blast resistance and trying to get a structure which is inherently more resistant you are able to achieve a great deal of blast resistance at low cost.

Mr. MORGAN. Mr. Cohen, in your article on blast-resistant design you have a sketch here on that. I wonder if you could explain that to the committee. It is on page 593 of the article. And how that is applicable to the various size weapons.

Mr. COHEN. Well, we have a combination here of two charts. The upper one shows the increase in cost required to bring the structure closer to the bomb without severe damage.

The lower chart shows the area involved. We have three horizontal scales, one for 20-kiloton bomb, one for 200-kiloton, and one for a 20-megaton or a 20,000-kiloton. This, of course, is to a certain extent approximate since it is based on the fact that the height of burst is

2,000 feet for the 20-kiloton bomb and the elevations of the others are increased as the cube root of the ratio of their weights to that of the nominal 20-kiloton bomb. If we come along on the top chart from a radius of 10,000 feet for the 20-kiloton bomb to approximately 6,000 feet there is an increase in cost of about 50 cents per square foot in the construction.

In other words, by spending an additional 50 cents per square foot for the building we are able to cut the radius from 10,000 feet to 6,000 feet.

Mr. MORGAN. What would this mean in the overall area of construction that would be reduced?

Mr. COHEN. That is shown in the lower chart. We would be saving this whole cross-hatched area which is marked, "Added protection—50 cents per square foot." Seventy-one percent of area saved at an increased cost of 50 cents per square foot. Although the radius is not quite cut in half, the area of damage is reduced about 70 percent.

Mr. HOLIFIELD. Is that aboveground shelter?

Mr. COHEN. We wouldn't refer to these as shelters.

Mr. HOLIFIELD. Just an added safety factor in construction.

Mr. COHEN. In construction, right.

Mr. MORGAN. These are all on the assumption of an air burst which would be most destructive in terms of blast effect.

Mr. COHEN. Well, no. These are based on air bursts at 2,000 feet, 4,300 feet, and 20,000 feet for the 20-, 200-, and 20,000-kiloton bombs respectively.

Mr. MORGAN. That would have a wider range of destruction from blast than would a ground burst.

Mr. COHEN. Oh, yes; definitely. The reservation I had was that the 20-megaton bomb might be detonated at some other elevation even if blast destruction were the primary purpose, but I don't think that would affect the validity of the chart to any great extent.

Mr. HOLIFIELD. We are interested, of course, in protecting the people whose buildings have already been built, because the majority of our building is already in being and we only add to it a few percent a year. So we are particularly interested in what can be done to give the people who have already built their homes or already living in homes a better chance for survival and I think then you would have to come down to the modification of existing buildings and the construction of special shelters of some type, either individual family shelters or block shelters or enlarged types of shelters. We are particularly interested in the cost that would be involved for that type of construction right at this time, or that type of modification for protection.

Have you developed any outside shelters, small family-type shelters? I know during the blitz in Britain they had the Morrison shelters, as you know. Has there been something of a modern type that has been developed that would be economical and yet would give reasonable protection for people outside of the immediate zero radius of the fireball, let us say?

Mr. COHEN. To get directly outside the fireball probably would be a relatively expensive proposition.

Mr. HOLIFIELD. I am thinking about a city, about any of the large urban centers. Then in the first place we don't know where the fire-

ball is going to be, where point zero is going to be, therefore you cannot figure a rigid formula of so many pounds per square inch in the first mile and so much afterwards and so forth. So it would seem to me to be practical about the thing we are going to have to consider a reasonable shelter which would give reasonable protection from both blast and heat and radiation and yet be within the bounds of what is economically feasible.

So what type of a shelter can the average family afford that will give them an increased chance of survival providing they are not right under point zero and its immediate radii?

Mr. COHEN. That is a little bit difficult for me to answer. The reason for it is this: Our part in this program has been to design these shelters or blast resistant structures for any given criteria. In other words, once the pressure range, and the criteria for radiation, heat and things of that sort are established then we can go ahead and design a shelter. We have designed shelters for homes which have been in the neighborhood of a thousand dollars. These satisfy certain criteria. The thing I hesitate on, is giving a blanket statement when I am not entirely sure what the criteria would be. As you pointed out, the bomb is not going to burst at some specific location and we can't draw ranges and say within this radius we need a certain type of shelter and outside a little more. There may be a variation in the accuracy of the drop or maybe the ideal spot may be so well protected that a bomb may drop outside of it.

Mr. HOLIFIELD. Let's not get so technical that we lose sight of some type of a practical solution. I recognize everything you said is true, but we are not going to be able to go to the people with any practical recommendations if we stumble on some of these technical points such as we don't know where point zero is going to be and therefore we can't tell you anything because we don't know. We have to tell them, I think something first within the bounds of economic feasibility and say that if you have this type of a structure and you're so many thousand feet or so many miles from point zero, this will heighten your chance for survival maybe by 100 percent or 75 percent or something like that.

Mr. COHEN. I agree completely with what you said. I just wanted to make our position clear on it. We know that this basemen exit shelter or something similar to it—the shape and configuration can be modified—for about 4 to 10 people which would reduce the danger area say 80 or 90 percent would run in the neighborhood of about a thousand dollars.

Mr. HOLIFIELD. What kind of an outside shelter, aboveground outside shelter? How much would that cost, that would give the same protection as a basement shelter?

Mr. COHEN. We are talking about blast entirely.

Mr. HOLIFIELD. I want to talk about blast and radioactive fallout, because they have to be protected against both.

Mr. COHEN. I am not sure—well suppose I put it this way—for protection against radioactive fallout, you would obviously be better below ground. I don't think there is any question that for the same protection against radioactive fallout, you would have a less expensive structure below ground because you take advantage of the earth.

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On the other hand, it is possible to design aboveground structures which for some bombs at some distances will give protection.

It is a question of how much protection you get.

Mr. HOLIFIELD. How much would it cost per person for a mainly family-type shelter, family of six to have a shelter underground in their backyard that would give them reasonable protection against blast and fallout?

Mr. COHEN. I would say probably $150.

Mr. HOLIFIELD. Could be built for that?

Mr. COHEN. Per person.

Mr. HOLIFIELD. Per person.

Mr. COHEN. Yes.

Mr. HOLIFIELD. That gives us something to go by.

What type of a shelter would you conceive of that shelter being? How thick would it be, how thick would the walls be? How many square feet would be involved? What would be the facilities in that shelter?

Mr. COHEN. I am getting a little bit out of my field, which is a technical structural design phase. I would say that a shelter with 8-inch reinforced concrete walls, with perhaps 3 feet of earth above it would take care of the blast and to a reasonable extent radiation. The area per person of course depends on how long they have to stay in that. I am not prepared to make any statement on that. I would say that probably 6 feet per person as far as area is concerned would be reasonable depending on how soon after an attack the shelter could be evacuated.

Mr. HOLIFIELD. Let's scale it up. Is that 6 square feet or 6 cubic feet?

Mr. COHEN. Six square feet as a minimum.

Mr. HOLIFIELD. For 6 people it would be 36 square feet.

Mr. COHEN. That would be about 6 by 6 shelter or 4 by 9 or something of that sort. Those are approximate figures.

Mr. HOLIFIELD. You think that cost about $900?

Mr. COHEN. I would say something like that, including the exits.

Mr. HOLIFIELD. And would that include any sanitary facilities?

Mr. COHEN. I think that it would. It is an approximate figure. The sanitary facilities as I visualize them would not be a big item.

Mr. HOLIFIELD. First, what would the overpressure, how many pounds per square inch would that protect you against?

Mr. COHEN. I would say probably 10 to 15, somewhat in that range.

Mr. HOLIFIELD. And do you have any scales to say how far out that would be from a one megaton bomb, from point zero?

Mr. COHEN. I think we could do that fairly rapidly, using unclassified data.

Mr. HOLIFIELD. Suppose it were 3,500 feet for a 20 kiloton; for a 20 megaton, it would be 35,000 feet or about 7 miles.

Mr. COHEN. To get the same protection?

Mr. HOLIFIELD. Yes.

Mr. COHEN. That envisages an 8-inch reinforced concrete wall with 3 feet of earth over it.

Mr. HOLIFIELD. Yes.

Mr. HOLIFIELD. In other words a completely underground shelter flush with the earth.

Mr. COHEN. Right. With an exit in the building and outside.

Mr. HOLIFIELD. I see you have then in the Architectural Record of March 1956 a description of the underground shelter for 40 persons and the description says:

> This special, heavy-duty shelter was tested at the Operation Cue atomic explosion at Nevada test site last May. Based on preliminary evaluation of these tests, it is believed that this shelter would afford adequate protection even in the outer ring of complete destruction surrounding ground zero.
>
> Designed to withstand an overpressure of 100 p. s. i., the structure is built of reinforced concrete with a 21-inch-thick roof which is 4 feet 7 inches below ground level. The entrance is closed by a sliding slab door of steel and reinforced concrete 8 inches thick, flush with the ground, and this is supplemented with a steel blast door at the bottom of the steps. An alternate way to the surface after an attack is provided by a vertical escape hatch which is filled with sand. A heavy steel trap door at the bottom of the shaft can be opened to let the sand slide into the shelter and so clear the hatch.
>
> Completely equipped with ventilation and its own self-contained power generator, this shelter can be built at a cost (estimated by FCDA) of $15,000 or $16,000.

That would be less than $500 per person.

Mr. COHEN. Right.

That, of course, includes quite an expensive accessway, a stairway with a bend in it and doors, so that the additional cost per person would be quite less if the shelter were expanded to a 50-man shelter, it would not be an additional $5,000 or $4,000. It might be a third of that figure.

Mr. HOLIFIELD. You go on to say—

> For a larger shelter, to hold 100 or more persons, the cost would be much less per person, since only the lengthening of the shelter room would be necessary. The structural design of this shelter was worked out by * * *

by your company?

Mr. COHEN. Yes, it was.

Mr. HOLIFIELD. The building of a shelter for a hundred people, say a block-type shelter could be built for possibly $250 or $300 a person, could it not?

Mr. COHEN. I think that would be very adequate for that size and the pressure range described above.

Mr. MORGAN. This article says that this could afford adequate protection even in the outer ring of complete destruction surrounding ground zero. Would this be true of the various size weapons regardless of size?

Mr. COHEN. This article was prepared by the Federal Civil Defense Administration and I believe that they probably had in mind a specific weapon but of course, we can scale that to some other size weapon. Probably for a 40 or 50 megaton weapon the radius might be in the range of 2 to 3 miles.

Mr. MORGAN. Forty or fifty megaton.

Mr. COHEN. Yes. That is approximate scaling.

Mr. HOLIFIELD. That would be an air burst, I imagine you are thinking of.

Mr. COHEN. The 100 p. s. i. range would get fairly close to the ball of fire. The distance scale factor from a 30 kiloton to a 30 megaton would be 10 to obtain the same pressures, so that the distance would

be increased by a factor of 10 which gives about 10,000 feet, approximately 2 miles. This is based on the Nevada tests.

Mr. HOLIFIELD. You have been working in this shelter field in designing and building and evaluating these shelters. Do you believe that the development of a shelter program is indicated by the type of warfare which may break out? Let me ask you about your own family. Do you think it is important enough to your family that a national program of shelters be evolved for the benefit of your family and other families in your urban target center areas throughout the Nation?

Mr. COHEN. That is my personal feeling. I would like to have some place for them to go and be protected in the event of a nuclear attack, certainly.

Mr. HOLIFIELD. Where do you live, may I ask?

Mr. COHEN. In the outskirts of New York City.

Mr. HOLIFIELD. What type of shelter arrangements do you have for your family?

Mr. COHEN. I have none.

Mr. HOLIFIELD. Do you know of your neighbors having any?

Mr. COHEN. I happen to live in a garden apartment type of development and there is no adequate shelter in the immediate vicinity of the area.

Mr. HOLIFIELD. Is there any organized civilian defense program in your area?

Mr. COHEN. I believe there is one but I am not familiar with it.

Mr. HOLIFIELD. Have you ever been given any instructions for evacuation or toward seeking shelter?

Mr. COHEN. I personally don't know of any.

Mr. HOLIFIELD. I am trying to find out your personal experience.

Mr. COHEN. Yes.

Mr. HOLIFIELD. Do you think the Nation has an adequate civil-defense program?

Mr. COHEN. I would say that we could possibly use a great deal of expansion and improvement in the civil-defense program.

Mr. HOLIFIELD. Do you think the FCDA policy should be one of evacuation from target areas or one of shelter or possibly of both?

Mr. COHEN. I would think it would be of both. I don't think we could rely entirely on shelters, since at this point we don't have very many shelters and we don't know what the size of the weapon is. As far as we know it is unlimited. I think we should be prepared for a certain amount of evacuation but I don't think we should ignore the possibilities of a shelter.

Mr. HOLIFIELD. You think that shelter would offer more protection to your family than evacuation with the possibilities of warning and the possibilities of knowing where point zero would be.

Mr. COHEN. It would depend on the amount of warning available. In my own mind I doubt that the amount of warning would be sufficient for my own family where they are living with the facilities they have for moving. I have 2 small children, one 6 and one 4, and my wife happens to be pregnant at this time, so I doubt very much if she would be able to evacuate very readily.

Mr. HOLIFIELD. If you did, you know at this time there is no plan to take care of large masses of population.

Mr. COHEN. I am not familiar with the general ramifications.

Mr. HOLIFIELD. Do you think a shelter policy is hopeless?

Mr. COHEN. I don't think it is hopeless, definitely not.

Mr. HOLIFIELD. Do you think it is within the bounds of our economical ability?

Mr. COHEN. Without having studied the matter, I would guess that a worthwhile program would be within the capability of our economy.

Mr. HOLIFIELD. We had a city of a million people and, say, we could give them protection for say $250 to $300 apiece, do you think that would be an unbearable burden to our economy?

Mr. COHEN. No; I think that would be a very reasonable expense.

Mr. HOLIFIELD. Do you think you and your neighbors would be willing to support such a program if the Federal Government got behind it and said that it was necessary in this age of nuclear warfare and the possibility of attack by a first-rate air power?

Mr. COHEN. I don't think there would be any hesitation or complaint about such a program.

Mr. HOLIFIELD. Do you think there should be some type of Federal aid for a shelter program of that type, either in tax benefits or in grants-in-aid?

Mr. COHEN. Yes; there is a definite need for Government assistance. I do not feel qualified to comment on the specific form of that assistance.

Mr. HOLIFIELD. Let's get back to the type of structures we have and let's get away from the tax problem; you have some knowledge of the type of structures we have at the present time; do you not?

Mr. COHEN. Yes.

Mr. HOLIFIELD. Do you think that the structures that we have are able to withstand megaton weapons, dropped over or near our urban population centers?

Mr. COHEN. I don't think the structures which we have here are to any substantial degree more capable of doing so than the structures which were present at Hiroshima or Nagasaki. There may be some variation with the city and an area, but not an important one.

Mr. HOLIFIELD. Do you believe enough study has been done at the present time by companies such as yours and other studies which have been made for the Defense Department branches to allow us to embark on a shelter program or do you think additional studies are necessary?

Mr. COHEN. As far as I know, the design, the technical design of such structures, can be done at the present time with the present information. Certainly we always want to improve our information, and do a better job, but I think that we have enough information to do a good job at the present time.

Mr. HOLIFIELD. You have confidence then that enough research has been done in the shelter field to justify the embarkation on a modest program in our top-priority target-center areas.

Mr. COHEN. I would think so; yes.

Mr. HOLIFIELD. Do you think that this program will be carried on if left up to local authorities and voluntary participation?

Mr. COHEN. I would doubt it in view of the general apathy. As I mentioned in my prepared statement there does not seem at present

to be a great interest in promoting such a program among the civilian planning people. I am not referring to civil defense but to people outside the Government, architects, and others. I think it is generally recognized that it is desirable and if it went ahead everyone would be very happy about it, but there does not seem to be sufficient impetus.

Mr. HOLIFIELD. But you as an engineer have worked with the consideration of these forces which are released by these nuclear weapons.

Mr. COHEN. Right.

Mr. HOLIFIELD. You know what happened at Hiroshima, what 20,000-ton bombs can do, and you know it has been released that there has been at least a 10-megaton bomb exploded. In view of the scale-up of destructive power which would occur in the differences between those two bombs, do you believe that this is an important factor for the people of the Nation to consider if they wish to survive?

Mr. COHEN. I think it definitely is.

Mr. HOLIFIELD. Do you think that it calls for close Federal and State coordination and a definite program to solve this problem?

Mr. COHEN. That would be my feeling.

Incidentally, this last civil defense air-raid test last summer——

Mr. HOLIFIELD. Operation Alert.

Mr. COHEN. Right.

Mr. HOLIFIELD. Did you participate in that?

Mr. COHEN. Yes. If it had occurred as it was assumed to have, I would not be here today, even though I was in what shelter was available.

Mr. FASCELL. You mean New York was wiped out?

Mr. COHEN. Pretty close.

Mr. HOLIFIELD. This committee has testimony before it every day that they hold hearings about the power of these weapons and the likelihood of the enemy making a break through and delivering them on a scale such as that conceived in Operation Alert. Yet we find apathy and indifference on the part of everyone concerned to this program, and, of course, we are seeking to find the facts of the situation, and we are also seeking to educate the people as to what might be expected.

Mr. COHEN. I think perhaps the reason for the apathy is that in the general mind it is considered to be an insurmountable problem.

Mr. HOLIFIELD. Do you consider it, as an engineer, insurmountable?

Mr. COHEN. No; I don't. I consider that the destructive effects can be alleviated and minimized.

Mr. HOLIFIELD. This is an important thing. None of us think there is a 100-percent solution. But if there is even a 50- or 5-percent solution, it might be worth investment, if we wish to survive as a nation.

Mr. COHEN. Right.

Mr. FASCELL. Mr. Cohen, from your viewpoint, would you recommend an individual structure or a multiperson structure, from the standpoint of, first, safety, and, second, from the standpoint of economy?

Mr. COHEN. I am afraid I did not get the import of the question. You mean a shelter for a single person as against——

Mr. FASCELL. Or a single-family unit.

Mr. COHEN. From the point of view of economy and better facilities, I would say the larger shelter would be the more desirable, other

things being equal. There may be other factors, such as lack of land area in which to build a shelter for the population of a whole block, say, whereas in the individual homes families may be able to make some provisions for themselves.

In other words, in a built-up area it may be possible to build small shelters, whereas a large shelter might not be feasible or may not be available.

Generally, we know, other things being equal, that large shelters would be more economical and more desirable than individual units.

Mr. FASCELL. You say more desirable. Do you mean from the standpoint of utility, safety, or what?

Mr. COHEN. From the point of view of safety because in the larger ones you would have more specific and more responsible engineering responsibility involved in the work, whereas the small shelters would, of course, be down at a lower level and would be the result of people working with plans and principles with which they may not be fully familiar and things of that type.

Mr. FASCELL. As I gather from your testimony, you feel then that multifamily shelters built pursuant to, say, Government standards would be a lot better than individual family shelters that might not be built pursuant to a sufficient engineering standard.

Mr. COHEN. Yes, right.

Mr. HOLIFIELD. But it could be possible that the Government could also approve of a family-type shelter, the specifications for a family-type shelter, which while it might be more expensive, would also have the safety factors imbedded in it.

Mr. COHEN. Yes. But in order to get the safety factors and the facilities built into a small shelter, you have certain fixed costs which result in a greater additional cost per person. For example, the ventilation system, blast valves, and so forth, would be difficult to provide at reasonable cost in a small family-type shelter, whereas they would be practical in a larger shelter where the cost is divided among more people.

Mr. HOLIFIELD. Would you tell us from an engineering standpoint, whether a square-type shelter above ground or an arched-type shelter would withstand blast, which would withstand blast the better?

Mr. COHEN. That is a difficult thing. It would withstand better at the same cost I presume.

Mr. HOLIFIELD. Yes.

Mr. COHEN. Same cost per square foot of usable area.

Mr. HOLIFIELD. Yes.

Mr. COHEN. That is something that becomes a design problem. In some cases land-use requirements may indicate an underground rectangular shelter. If that were not a consideration this belowground 40-person shelter which was tested at Nevada could have been a mounded dome or arch, but the form-work for the concrete would have been more expensive and because of the dead space up above and the dead space on the sides which is not usable the overall volume would have been larger. I would not want to make a general statement. When a specific site is selected one or the other may be the most feasible.

Mr. HOLIFIELD. From the standpoint of blast striking a curved surface though, it would be——

Mr. COHEN. You have an inherently better situation.

Mr. HOLIFIELD. If it was aboveground?

Mr. COHEN. Yes.

Mr. HOLIFIELD. If it was belowground, you might have more usable space to have a rectangular type of shelter?

Mr. COHEN. Right. You might have more material involved. But you would not have the excess space.

There is one other point in connection with that. There, of course, is a certain minimum thickness of earth and concrete that you would want to use just for radiation protection. So that you don't actually get a saving until the blast requirements go beyond that. If you need 2 feet of concrete to cut down radiation, and you need less than 2 feed for blast resistance you will still need the same 2 feet over a bigger area if you use a curved shape or you would have to go deeper or mound up higher.

If you needed, however, 6 inches of concrete plus a minimum depth of earth cover for radiation and a foot with a rectangular building for blast, then you might be able to get a saving by reducing the thickness over the longer length of the curved surface. If long-span construction is required for some special purpose, reinforced concrete dome or arch construction should be considered.

Mr. RIEHLMAN. In view of the fact that Mr. Cohen made a statement in respect to the area he lives in in a garden-type apartment; is that correct?

Mr. COHEN. Yes, sir.

Mr. RIEHLMAN. And you had said there is complete apathy on the part of the people in that area with respect to this great problem; they think it is an insurmountable one. And in view of the fact that our committee is searching for information that will be constructive and helpful to bring to the attention of the American people the need for their having an interest and trying to do something for themselves, do you have any suggestions that you can give to the committee so we can pass it on to Federal Civil Defense as to how we can promote an interest on the part of the American people to this danger and what they can do to help themselves.

Mr. COHEN. I think that the approach that Chairman Holifield has mentioned of bringing to the attention of the people that the problem is not insurmountable; that there is quite a bit that can be done for protection.

Mr. RIEHLMAN. Do you feel that the work that you have already done under contract for Federal Civil Defense, the work that your company has done, if that is passed on to the people, that there is a good possibility that with a minimum amount of expense, even in their own homes and in their backyards they can build some type of protection for themselves? Do you think that, that if properly publicized, would take hold in our country?

Mr. COHEN. I am not sure but I can say this. We have designed one private shelter for a man in Westchester. We are at present preparing preliminary studies of a 10-story blast-resistant office building. There has been considerable interest expressed in these plans which we prepared for a blast-resistant house by actual builders, and other people of that type who feel that it is a selling point in a house. There was one man who was talking to me yesterday. He is a builder in New Jersey and he is very much interested in developing house plans

for blast-resistant houses. He has an idea of perhaps not making the entire house blast-resistant but having a blast-resistant basement in the house and he feels that would be a very strong selling point to the people in that area.

I just mention these. I myself don't feel I have any specific recommendation. The initial effort will probably have to be made by the Federal Government.

Mr. RIEHLMAN. The people that are in your own organization have made a very thorough study of this and apparently have drawn up certain specifications for blast-resistant construction for FCDA. Do you know of any of them who have provided for protection in their own home?

Mr. COHEN. No, I think they are in the same boat I am.

Mr. RIEHLMAN. That is what is bothering me. People who know the answers to these problems are not doing very much to protect themselves or their families. I am wondering how well we will get it across to the American people who know so much less than you do. That is the tough question.

Mr. COHEN. Right.

Mr. HOLIFIELD. Mr. Cohen, we have here three books put out by the Federal Civil Defense Administration on the subject of design of buildings, shelter from atomic attack, designated as the M–5–3, the M–5–2, and the M–5–1. And the M–5–4. The first three that I mentioned were put out in 1952. And the last one I mentioned was put out in January of 1953. Are you familiar with those books?

Mr. COHEN. Yes; I am.

Mr. HOLIFIELD. Would you say they are current, they contain information that is reliable in view of the development of the hydrogen bomb?

Mr. COHEN. The methods—speaking particularly of the larger book——

Mr. HOLIFIELD. The M–5–4.

Mr. COHEN. M–5–4, Windowless Structures: A study in Blast-Resistant Design.

I think the detail methods of design and of calculation of pressures have been greatly improved since that was released.

Mr. HOLIFIELD. You mean you have better information than is contained in this book?

Mr. COHEN. Yes. Even at that time, there may have been better information which was in a classified state. But that was the best information which was available and was declassified. However, the ideas given there are still sound. The type of building described a windowless reinforced concrete structure with shear-wall-type construction, automatically gives you higher strength. The methods of calculating the strength of the building, while they may have been improved, are still useful. I think that this paper which we prepared and which has been reprinted by the American Concrete Institute from its Journal of March 1955 may be considered to supersede M–5–4.

Mr. HOLIFIELD. But that's a privately printed book, is it not?

Mr. COHEN. That's right.

Mr. HOLIFIELD. That does not have wide distribution such as the FCDA pamphlets?

Mr. COHEN. I don't know what the relative distribution is. I would imagine so, although there has been a great deal of interest in this paper and I understand that it is being translated into other languages.

Mr. HOLIFIELD. It goes mostly to professional builders though rather than to——

Mr. COHEN. It does not go to the general public; no.

Mr. HOLIFIELD. Of course, any study, however valuable, anybody on the windowless structures would not apply to the millions of Americans who are living in windowed structures; is that not true?

Mr. COHEN. It does in this sense that in the design of a shelter or anything of that type, the methods and principles involved are very similar.

Mr. HOLIFIELD. From the standpoint of theory then, from the standpoint of technical knowledge this book would be valuable for future structures.

Mr. COHEN. Right. It is a book primarily for engineers and architects. It is not for the lay reader.

Mr. HOLIFIELD. Any further questions?

Thank you, Mr. Cohen, very much for your appearance here this morning.

The staff has handed the chairman a pamphlet by Boyd G. Anderson, of Ammann & Whitney, consulting engineers, and Ellery Husted, of Gugler, Kimball & Husted, architects, reprinted from the June issue of Architectural Record 1955, the title is "Schools Can Be Made Blast-Resistant," and in this pamphlet they say many schools are vulnerable.

Most people are unaware of the vulnerability of the average American school (or for that matter, of most other buildings) to bomb blast, earthquake, and high winds. They judge by appearance only. Many schools, new as well as old, particularly those of wall-bearing construction, are vulnerable to all the effects of atomic weapons—blast, fire, flash, radiation, splintering glass, flying debris—and many are equally vulnerable to natural disasters.

A view of complete helplessness against A-bomb or H-bomb attack should not be accepted. Many new schools, following housing trends, are being built on the outskirts of big metropolitan centers. What might be considered minimum protective measures for such schools may be surprisingly effective, since they will generally be at sufficient distance from the main target areas to make it unlikely that they will be exposed to the most intense blast pressures. The important thing is that this knowledge be put to work now, while there is still time.

Mr. Cohen, Mr. Morgan says he has one more question if you will please come back.

Mr. MORGAN. We would like to have your opinion as to whether or not you feel that there should be incorporated into the building codes certain requirements on blast resistance design.

Mr. COHEN. Yes; I think just as there are requirements for earthquake resistant designs in the State of California and other west coast States, if we feel that this problem is a real one, then we should prepare for it in the same way, certainly.

Mr. MORGAN. In your opinion you would say that it should be incorporated into the building codes.

Mr. COHEN. Yes.

Mr. HOLIFIELD. You know that we are spending $35 billion in this year for military offense and defense capabilities, do you not?

Mr. COHEN. Approximately; yes.

Mr. HOLIFIELD. And you know that the Congress has just appropriated $85 million to defend the 75 million people from the civil-defense standpoint in our urban areas, in our most thickly populated urban areas.

Mr. COHEN. I do want to mention——

Mr. HOLIFIELD. There is no thought in your mind that the problem does not exist, is there?

Mr. COHEN. No, sir. Earlier we spoke about the fact that some of these things that I mentioned apply to new construction and I feel that even so, it is quite important because at a replacement of even 2 or 3 percent a year, we have built up an additional 30 percent in the course of 10 years and if that 30 percent is blast resistant we have come a long way.

Mr. HOLIFIELD. I agree with you. And if the factor of dispersal is also taken into consideration, during that same period of time, we could disperse, we could have a balanced dispersal of our industries which would almost be equivalent to the total productive capacity of the Soviet Union at the present time, so we are told.

Mr. COHEN. I think that is a very important——

Mr. HOLIFIELD. I think that figure is something like 30 percent of our industrial capacity would be dispersed if we went at it in the manner over a period of 10 years.

Thank you, sir.

Our next witness will be Dean Harry L. Bowman, consultant to Atomic Energy Commission and dean of the School of Engineering, Drexel Institute of Technology. His subject will be Atomic Energy Commission Findings on Shelter Considerations.

Mr. Bowman, we are pleased to have you with us this morning and will appreciate your giving us your testimony. I see you have a short prepared statement.

Mr. BOWMAN. Yes, an outline I may depart from.

STATEMENT OF H. L. BOWMAN, CONSULTANT, DIVISION OF BIOLOGY AND MEDICINE, ATOMIC ENERGY COMMISSION

Mr. BOWMAN. First I state that the Atomic Energy Commission has a dual interest in shelters:

(1) It must consider the protection of its own workers who are in highly vulnerable locations.

(2) The Federal Civil Defense Administration looks to the AEC for technical assistance and guidance.

My own experience began in England with shelters exposed to high explosive bombs, those were brick shelters, so-called reinforced brickwork. Then in Germany there were many large shelters which would have been effective against an atomic bomb at sufficient distance. However, our first experience with shelters under the atomic bomb dates from Hiroshima and Nagasaki and some of the experience that came out of there was a bit deceptive because we were told that people who were in shelters and in buildings near ground zero survived.

Later examination of the data proves that this is true but it wasn't the whole story. For example, the Atomic Bomb Casualty Commission put out a report in 1953 that points out that a woman did survive in a shelter that was within a hundred meters of ground zero at

Nagasaki but it points out the fact that she was one of a hundred people. She was 1 of 2 people who survived out of a hundred who were in the shelter. That she was badly blown about and she was burned. And the evidence that we have now, the Atomic Bomb Casualty Commission's evidence, is that no person who survived within 500 meters of ground zero, about 1,600 feet or so, no person survived that was not burned.

Mr. HOLIFIELD. Thermally or by radiation?

Mr. BOWMAN. Thermally burned. Even though they were in shelters that had sufficient protection against radiation they were thermally burned because these shelters were without doors. However, we lacked that information in 1951 at the time of the Buster-Jangle tests. We felt then in order to provide a shelter all we needed to do was to have a shelter that would survive structurally, that if we had a shelter which survived the people in the shelter would survive.

In consequence we tested, and I have slides I can show later, an open pipe shelter made up at one end of concrete sewer pipe and the other end of corrugated iron, 90 inches in diameter with ramp entrances at the ends. This shelter was buried under about 3 feet of earth and had another 3 feet mounded over it. It was tested and the shelter survived. It not only survived the 4 bombs of the 1951 series but it also has been bombed since and is probably the world's most bombed structure.

Mr. HOLIFIELD. Where is this located, sir?

Mr. BOWMAN. It is at Nevada. It is one of the Nevada shelters. So that is evidence that it's not much of a problem to provide a shelter which will survive structurally, but we found out that the pressures inside that shelter built up to high levels, that there were evidences of high heat inside of it and the radiation levels particularly at the end would have been hazardous. That confirms the information which I say has now come out of the Japanese experience that there were many who did not survive in shelters that were near ground zero.

Mr. HOLIFIELD. This was a shelter that was 1,600 feet from ground zero.

Mr. BOWMAN. Approximately that.

That shelter has been subjected to pressures up to about 40 pounds per square inch.

Mr. HOLIFIELD. What can the human body withstand?

Mr. BOWMAN. That is extremely difficult to answer for this reason. Deep-sea divers will withstand the pressures that are up around 100 pounds per square inch or thereabouts, but those pressures build up very slowly. Blast pressures build up rapidly. We know that a pressure that builds up slowly can be endured and the one that builds up rapidly cannot. And the evidence now is not complete as to what a person can take.

Mr. HOLIFIELD. Of course there is a great deal of difference in individuals. A deep-sea diver is a trained man who has subjected himself gradually to these pressures and he has achieved an ability to withstand them which an ordinary child or woman or even an ordinary man could not withstand.

Mr. BOWMAN. The people who work under compressed air in foundation construction will work under 40 pounds per square inch or

thereabouts for prolonged periods but again they build up to that very slowly and they are brought out very slowly which is a different problem than from a blast problem.

Mr. HOLIFIELD. Did you have radiation measurement devices in this shelter?

Mr. BOWMAN. There were.

Mr. HOLIFIELD. What was the roentgen exposure in the shelter?

Mr. BOWMAN. I don't remember the exact figures except I remember they were too high at the end.

Mr. HOLIFIELD. It was lethal.

Mr. BOWMAN. Yes, sir.

Mr. HOLIFIELD. And this related to a bomb that was less than 50,000 kilotons?

Mr. BOWMAN. That is right.

Mr. HOLIFIELD. You would have to scale this up considerably to make them realistic in the face of bombs that would run from a million to 5 or 15 or 20 million tons?

Mr. BOWMAN. Yes. Beyond the area where the radiation was lethal, the pressures in a shelter without doors would still be too high for a person. That is the pressure values would run out to great distances and they would be lethal beyond limits where the radiation was lethal.

Mr. HOLIFIELD. Could you give this committee a statement estimating the p. s. i. from a 10 megaton bomb in terms of distance of 10 miles or 7 miles?

Mr. BOWMAN. Ten megatons?

Mr. HOLIFIELD. At 10 miles, for a medium air burst, say, a mile above the ground.

Mr. BOWMAN. The pressure would be somewhere around five pounds per square inch.

Mr. HOLIFIELD. So that would be bearable.

Mr. BOWMAN. For a person, yes.

Mr. HOLIFIELD. Does that increase rapidly as you come in?

Mr. BOWMAN. Yes, that builds up quite rapidly.

Mr. HOLIFIELD. Just as a matter of interest what is the difference between the 10-mile and the 5-mile pressure?

Mr. BOWMAN. Multiply it by about three.

Mr. HOLIFIELD. It would be about 15 pounds.

Mr. BOWMAN. Yes.

Mr. HOLIFIELD. It would still be bearable as far as pressure is concerned.

Mr. BOWMAN. As far as pressure goes, yes.

Mr. HOLIFIELD. In the construction of shelters, would ordinary close fitting cement sliding doors, would you still be subject to the pressure if that type of structure was built underground——

Mr. BOWMAN. No, you can build a safe structure. Mr. Cohen has just testified that the structures with doors which I will mention just briefly because they were also tested in Nevada in the 1955 series, withstood pressures of about 100 pounds per square inch.

Mr. HOLIFIELD. I think maybe you better proceed with your statement.

Mr. BOWMAN. Based on what we learned in this first open-door shelter we were still hopeful to build shelters without doors because

we had the feeling that if you build a shelter with a door the first person that gets there in an alert will want to close the door. And therefore we built a second series of shelters for Upshot-Knothole that were tested in 1953 where by means of vestibules and baffle walls we tried to cut down the pressures and did succeed reasonably well. These shelters were subjected to pressures of about 15 pounds per square inch. They were safe from the radiation hazard. We are not sure about the thermal hazard because the instrumentation broke down. The pressures were cut down and while the pressures inside the shelters built up to about the same values as the pressures outside the shelters, the rise time was cut down considerably and therefore it would have been very much easier for a person to live under the pressure than it would have been in the outside pressures.

Mr. BOWMAN. It was cut down to factors which were tolerable. Based on these 1953 shelters the shelters were tested in the Operation Teapot in 1955 which Mr. Cohen has just mentioned.

This was a joint FCDA–AEC venture, joint to the extent at least that FCDA paid for the shelters. AEC paid for the specimens, dogs and mice and rats, which were put in the shelters. It was a joint venture. In connection with that shelter——

Mr. HOLIFIELD. These shelters were above ground, may I ask?

Mr. BOWMAN. No, they were buried 4½ feet. The ones I am talking about were buried under 4½ feet of earth.

Mr. HOLIFIELD. How close were they within ground zero?

Mr. BOWMAN. About a thousand feet.

Mr. HOLIFIELD. Has the information on the power of that bomb been released?

Mr. BOWMAN. That is not released, I believe.

There is one thing I would like to point out in connection with this whole matter of shelter design.

Mr. HOLIFIELD. Before you go to that, what happened to those shelters?

Mr. BOWMAN. The shelters are intact but the evidence is that the shelters moved about 2 inches.

Mr. HOLIFIELD. Even though they were buried in the ground.

Mr. BOWMAN. Yes. And the bomb itself was on a high tower.

Now there is every possibility as we know that the bomb shall be detonated on the surface of the ground, in which case you get a large crater in which nothing will survive and in addition you will get terrific ground shock which extends out great distances. I think I may say that at this time we lack information as to the distance at which a person could survive in the ground under those circumstances.

The shelter would survive. We do not know the distance at which a person would survive due to the ground shock.

Mr. HOLIFIELD. You are speaking now of the megaton thermonuclear weapon.

Mr. BOWMAN. I am speaking, sir, of a bomb of any size if you get at the right distance from it. Even a small bomb if you come close in will give the same effect. If you get a large bomb——

Mr. HOLIFIELD. We know that these Nevada bombs were small ones.

Mr. BOWMAN. Yes, that is true.

Mr. HOLIFIELD. The thing you are talking about now are bombs in the thousand-ton range and middle thousand-ton range and not in the million-ton range.

Mr. BOWMAN. That is right. Regardless of whether you talk small bomb or large bomb there are distances from the point of detonation where the effect would be substantially the same.

Mr. HOLIFIELD. And that distance is variable according to the strength of the bomb and the mathematical calculation which can be made of the decreasing power.

Mr. BOWMAN. That bomb, sir, you ask about was in the 30 to 35 kiloton range.

Mr. HOLIFIELD. I knew it was.

Mr. BOWMAN. I don't remember whether it was released or not. I just was handed a note that it was.

Mr. HOLIFIELD. I was out there.

Mr. BOWMAN. I know you had a considerable background in this myself. I think you can give part of the testimony from what I have listened to.

As you know, the unknowns in shelter design now are some of these biological factors and the Civil Effects Test Group which is working on these has performed a large series of tests at both Upshot-Knothole and at Teapot to fill in these gaps.

Mr. HOLIFIELD. What happened to the animals in those shelters, Dr. Bowman?

Mr. BOWMAN. Most of them survived.

Mr. HOLIFIELD. Were they burned radioactively?

Mr. BOWMAN. No beta burns, but some located near open parts received damaging gamma radiation.

Mr. HOLIFIELD. Could you give us what you think would be a reasonable type of shelter for a family or for multiple shelter such as would be necessary for a block, the requirements which would be needed in that type of a shelter, to give a reasonable chance of survival in view of the fact that we will not know where point zero will be?

Mr. BOWMAN. As you point out, there are uncertainties. We know neither the height of the burst nor the location of ground zero.

Mr. HOLIFIELD. Or the strength.

Mr. BOWMAN. Or the strength. Therefore, you have to assume what pressure you want to design for. I know that Federal Civil Defense, whom I believe will have an opportunity to present what they have done in shelters to you later have worked with certain types of basement shelters. They have had lean-to's in the basement, simple timber lean-to's on which a building could collapse and yet the lean-to itself could survive.

They have had affairs which remind you of a reinforced old-fashioned coalbin which will survive under the collapse of the building, which can be built at reasonable cost and for a bomb of any size in some area where the buildings themselves collapse, would provide protection against collapse. If it is a ground burst, the radiation fallout hazard might still be high. Then there are the shelter types which have also been mentioned here this morning, a reinforced bathroom or something of the size of a bathroom that can be built in a building for a few hundred dollars, that survived the collapse of the buildings themselves in the Nevada tests.

Mr. HOLIFIELD. The type of a shelter we are talking about must of necessity be the type of shelter that a family could live in for several days or maybe a week or 10 days, because of outside radioactivity.

Mr. BOWMAN. That I appreciate. Also the shelters that you build whether they are community shelters or small family shelters, under the present fallout hazard, must have water, they must have food, they must probably have light, they must have seats or bunks. They must have some provision for changing the air. And those things are going to run the costs up considerably, I believe.

Mr. HOLIFIELD. Must have toilet facilities and air facilities and air filters.

Mr. BOWMAN. I am not sure about air filters if the shelter can be closed while the fallout is coming. Thereafter if there is facility for taking in air from some distance above the ground that would suffice instead of the use of filters?

Mr. HOLIFIELD. What do you envision could be standing?

Mr. BOWMAN. Some sort of a pipe that could be pushed up after the fallout comes.

Mr. HOLIFIELD. To get it away from the ground?

Mr. BOWMAN. Yes.

Mr. HOLIFIELD. Where the residual radioactivity would be.

Mr. BOWMAN. Yes.

Mr. HOLIFIELD. It would be necessary also for a shelter such as that to have radiation-detection devices or instruments, would it not, for the safety of the persons inside?

Mr. BOWMAN. Either there must be a radiation-detection instrument in there and somebody who knows how to operate it who can tell the people when to come out or the people must stay there until someone from the outside comes and tells them what they must do.

Mr. HOLIFIELD. From your knowledge of this hazard, Mr. Bowman, do you believe that this is an important matter for the Federal Government, the Congress and the Federal Government to consider?

Mr. BOWMAN. I know of no more important one.

Mr. HOLIFIELD. You had a great deal of experience in this field. Your background is a very distinguished background. And you have supervised the bomb surveys in Hiroshima and Nagasaki. You have been a consultant to the Atomic Energy Commission. Do you feel that the Nation is in a position to withstand a nuclear attack such as that envisioned in Operation Alert?

Mr. BOWMAN. It is not.

Mr. HOLIFIELD. Would there not be millions of casualties and almost complete chaos in our Nation if such an attack occurred?

Mr. BOWMAN. Yes. It is hard to visualize the chaos that would result. Basing an answer on what happened in Japan, you must realize that the populous nucleus would be wiped out and you would have to depend on immediate succor coming to the people who were trapped in collapsed buildings and in shelters from a relatively less populated area on the outside. If Washington were hit, and Washington alone, you would have to get your major help from Richmond and Philadelphia and Wilmington and Baltimore and it would take a long time for that help to get here. It doesn't appear as soon as the bomb drops.

Mr. HOLIFIELD. Do you believe that our military program could be carried forward with 50 or 60 of our urban centers in a shambles as a result of the breakthrough by the enemy, considering the logistics of supply and continued production and so forth?

Mr. BOWMAN. You are out of my field. I think the Air Force could continue to operate, to retaliate. Both sides would be knocked

out then and I don't know what good that does either us or anybody else.

Mr. HOLIFIELD. Do you think in our picture of total defense it is essential for us to have maximum survival on the civilian front and maximum continuity of our productive process to continue military operation?

Mr. BOWMAN. I am completely over my depth, sir. But under atomic bomb attack I don't know how long the war is going to last, if massive attacks are made, whether there would be the will to continue on anybody's part. I imagine there would be.

Mr. HOLIFIELD. We have some very high military people who think that such a war would be over within a week or 10 days.

Mr. BOWMAN. I don't think that you could depend on what you would produce after the war started.

Mr. HOLIFIELD. In other words the war would have to be fought with the troops and the materials in being and accessible to the military.

Mr. BOWMAN. I will say yes to that, if you will let me add that that is the viewpoint of a layman and not a military person.

Mr. HOLIFIELD. Sometimes laymen have pretty good judgment about things along this line, I might say.

It would be interesting to know if you have provided a shelter for your family.

Mr. BOWMAN. I have not.

Mr. HOLIFIELD. Why haven't you?

Mr. BOWMAN. We have a pretty good part in our cellar that I think would stand the collapse of the house.

Mr. HOLIFIELD. I have not prepared a place for my family either so I am not trying to put you on the spot. But I think this is important.

Mr. BOWMAN. I have a spot in the cellar where there is a cold closet that projects out that has short span beams over it that would serve as a shelter, I believe, although it was not built for that purpose.

Mr. FASCELL. What good is it though? You survive the falling of the house?

Mr. BOWMAN. If you are in a fallout region, you could survive there for a number of days.

Mr. FASCELL. Well, maybe I misunderstood you. You are assuming complete cover in this basement shelter, even though the house has collapsed.

Mr. BOWMAN. Yes. Are you talking now about fallout, sir?

Mr. FASCELL. Yes, sir.

Mr. BOWMAN. It would depend largely on whether the collapse followed a ground burst which caused a great deal of fallout or an air burst which did not. It would make a considerable difference. I concede that.

Mr. HOLIFIELD. Isn't it a tragic thing that these conditions exist, and yet there is nothing being done to protect the people. There is no conviction on the part of the people that this hazard exists.

Mr. BOWMAN. Sir, we have never been under attack, and I believe that in England and Germany they needed the dropping of bombs to get a civil-defense organization actually functioning. Here under atomic-bomb conditions that would come too late.

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Mr. HOLIFIELD. And hasn't the whole concept of warfare changed since the hydrogen bomb was developed in 1952?

Mr. BOWMAN. It certainly has.

Mr. HOLIFIELD. In other words, the problems that existed before which could be solved on a local basis can no longer be solved by small geographical units or political units.

Mr. BOWMAN. I believe that is right.

Mr. HOLIFIELD. Does this not indicate the need for target area planning if we are to have any type of civilian defense?

Mr. BOWMAN. It needs more than target-area planning, sir. The target area that is hit will not help itself. The help must come from the outside.

Mr. HOLIFIELD. You are speaking, of course, of the immediate area. You are not necessarily speaking of the radioactive pattern which may go several hundred square miles downwind.

Mr. BOWMAN. No; I am not speaking of that. I am speaking of the fact that in any city you might mention, under an atomic-bomb attack that was successful, you would have the same percentage of casualties, among the doctors, the nurses, the police, the firemen, that you have in the general population. You lose all your power, you lose your telephone, you lose your telegraph. You have no water, you have no gas, you have nothing.

The area is burning, and that area is not able to do anything for itself. The help must come from the outside. The help will be in many instances too late to reach people who are trapped.

Mr. HOLIFIELD. In view of this situation, do you think it is worth while that we should make an effort to develop a civilian defense?

Mr. BOWMAN. I think we should have a strong civilian defense.

Mr. HOLIFIELD. You think there is a chance for increasing the percentage of survival if we do plan for this and utilize the intelligence and information and knowledge that we have and the resources that we have to give the 75 or 80 million people in our target areas a chance to survive?

Mr. BOWMAN. I do; and the mere fact that such plans were made and were known might in itself deter an attack.

Mr. HOLIFIELD. In other words, if our civilian population could withstand the shock of an attack, the enemy could not count on complete chaos and capitulation, you might say.

Mr. BOWMAN. That is correct.

Mr. FASCELL. Mr. Chairman, is the nucleus of this defense pattern a shelter program?

Mr. BOWMAN. If there is time to evacuate it is a much better defense because there is no defense against the bomb like being away from where it goes off.

Maybe, if you know in advance, with enough warning you can get away. Then evacuation is a help. But these people that evacuate must be taken care of, so there is still a problem to be solved.

Mr. FASCELL. Then it is your thinking that evacuation is the first element for consideration in a defense plan.

Mr. BOWMAN. I believe it is; yes, sir.

Mr. FASCELL. Assuming that you have enough warning time to evacuate.

Mr. BOWMAN. That's right.

Mr. FASCELL. A target area of several hundred thousand people to several million people.

Mr. BOWMAN. Yes. But these people must evacuate into an area where there will be at least protection against fallout.

Mr. FASCELL. So you would have to have that type of planning?

Mr. BOWMAN. That is correct.

Mr. FASCELL. Then assuming that you had no ample warning time——

Mr. BOWMAN. Then you take the best shelter you have and at some distance from the bomb that shelter becomes adequate and those who are closer to the bomb than that will lose their lives.

Mr. FASCELL. Then it becomes a question of some type of a shelter program and also a question of what is adequate.

Mr. BOWMAN. Yes.

Mr. FASCELL. Do we know what is an adequate shelter at the present time?

Mr. BOWMAN. It depends on the level of protection you want to give, sir. I think the answer is "Yes." If you set the level of protection a shelter can be designed to give that level of protection.

Mr. FASCELL. All right, sir. Let's set a level of protection, just as a matter of hypothesis.

Mr. BOWMAN. Are you setting it or I?

Mr. FASCELL. You. You are the expert.

Mr. BOWMAN. Well, suppose you said that you wanted a shelter that would resist 20 pounds per square inch pressure.

Mr. FASCELL. Why would you pick that as a hypothetical one?

Mr. BOWMAN. I picked it out of the air.

Mr. FASCELL. Suppose we were making recommendations to 48 States and several hundred cities that were going to incorporate this thing into a building code or we were thinking about the Federal Government imposing a building requirement for shelters and we were just striking an average or a mean or a norm or something in the way of a protective factor?

Mr. BOWMAN. I think, sir, that before any answer can be given as to the level of protection that you wanted to achieve that it would be necessary to sit down and make designs and find out what the cost is, because it is impossible I think to separate this completely from cost. It has to be reasonable.

Mr. FASCELL. In other words you mean there is a point where cost is such a factor that there is no point in building the shelter.

Mr. BOWMAN. You would not have the money. It would just be beyond what you could feel you could spend. If you set too high a level of protection and tried to give that level of protection to everybody in an urban area, you could set the level at a point where you would feel you could not stand the cost.

Mr. FASCELL. So you would more or less have to reach out into thin air and just grab a reasonable level of protection and apply it to everybody even though in some cases it would be below the line and in some cases above the line.

Mr. BOWMAN. Yes.

Mr. HOLIFIELD. Let's clarify that a little bit.

You would want a structure—in arriving at this reasonable level—you would want a structure that would protect a person against an injury, an injurious atmospheric pressure.

Mr. BOWMAN. That's right.

Mr. HOLIFIELD. You would want one that would protect him against radiation.

Mr. BOWMAN. That is right.

Mr. HOLIFIELD. You would want one that would protect him against thermal burns.

Mr. BOWMAN. That is right.

Mr. HOLIFIELD. If you had a reasonable level of protection in those three fields, including blast of course, blast would be your psi.

Mr. BOWMAN. Yes, sir, you mentioned pressure.

Mr. HOLIFIELD. Then you could arrive at a fairly sensible standard, it would seem to me, which could be applied in an economical way and which would give the majority of the population a much greater degree of protection than could have without it.

Mr. BOWMAN. That is correct.

Mr. HOLIFIELD. And to those people who were not within let us say the fireball or immediate adjacent area thereto, you would give them a greatly increased chance of survival.

Mr. BOWMAN. You would.

Mr. FASCELL. Would you believe me, Mr. Bowman, if I told you I would be very interested in building a shelter for my family but at this point I would not know where to go or what to build. Do you know where I could get the information?

Mr. BOWMAN. Civil Defense has booklets that show the plans of the shelters that were built in Nevada. The booklet that the chairman had in his hands showed the basement-type shelter which if you were far enough from the city would be adequate.

I would want to know where you will build the shelter.

Mr. FASCELL. Do these shelters in the booklets you are talking about offer reasonable protection?

Mr. BOWMAN. The basement shelters that I mentioned I think would stand up under pressures that could collapse the house. The underground shelters which were last tested in Nevada stood 100 pounds per square inch.

So you had that range and you could pick in the range what you want to provide.

Mr. FASCELL. The one I want is the one that will keep me alive if I am in it.

Mr. BOWMAN. Nobody can give you the answer unless you can tell them how far you are going to be from where the bomb goes off, how high the bomb goes off and what the strength of the bomb is.

Mr. FASCELL. I can't tell them that.

Mr. BOWMAN. Nobody can tell them.

Mr. FASCELL. I can't tell the architect or builder or engineer that, so what is he going to build for me? All I want is reasonable protection. I am an American citizen and I am willing to pay for it. Isn't it the truth of the matter that we don't have sufficient studies right now to embark on a shelter program?

Mr. BOWMAN. We have a considerable number of shelter plans in being, shelters which have been tested in Nevada, the only uncertainty is for you to decide which one you think is going to give you adequate protection.

Mr. FASCELL. Well, then at that point it would certainly require a study.

Mr. BOWMAN. It would.

Mr. FASCELL. If we are going to apply a plan, an overall program as to what degree of protection we will be shooting for.

Mr. BOWMAN. If you begin to build them for 60 million people.

Mr. FASCELL. That is the point.

Mr. BOWMAN. Then you have to begin to find what you can stand. There is one other thing that came out of some of the dispersal in Germany during the war. If anything of that sort is too long delayed, you give yourself an impossible problem. Then everybody wants to build at once and you don't have materials and you don't have transportation and you don't have workmen. Building shelters for 60 million people is going to take a long time and cost a lot and must be planned for in advance if it won't completely upset the economy of the country.

Mr. FASCELL. The requirements which you set forth in your statement that a shelter should have can now be met structural engineeringly and otherwise.

Mr. BOWMAN. That is right.

Mr. FASCELL. And the other factor of cost would depend upon the amount of protection you desire to get.

Mr. BOWMAN. That is right.

Mr. FASCELL. Once that is determined on the overall basis of the number of people you are trying to serve, you could go ahead with a program of either multiperson shelters or single family shelters.

Mr. BOWMAN. Right.

There is one other thing I would like to mention, sir, if I may. In the case of underground shelters where you are taking in air, you must take into account the fact that there is a possibility of fire storm. In both Germany and Japan, great numbers of people were asphyxiated in shelters. But in this country, I think that your shelters in most instances which were out far enough for the shelter to be safe would be in areas where there would not be enough material to produce a fire storm and that you would not have that same problem.

Mr. FASCELL. Now you have me all scared again, Doctor. Am I going to build this shelter of mine or not? If I have to run a stovepipe up, how far do I have to run it up after this radiation falls down?

Mr. BOWMAN. I would say 10 feet.

Mr. FASCELL. Then I have to be sure that the oxygen does not burn inside the shelter.

Mr. BOWMAN. I think if you are out far enough that your shelter survives, there won't be enough combustional material around you that you will have the fire-storm problem.

Mr. FASCELL. This thing is getting so bad I will use the *Nautilus*.

Mr. HOLIFIELD. Mr. Bowman, you mentioned on the last page of your statement the civil effects test group and I have been furnished by the staff here a group of studies which have been made by the FCDA, the AEC, the biology and medical department, and some private individuals, I believe, the university, and if there is no objection on the part of the members of this subcommittee, we will include this

3-page list of these civil effects test group studies and programs as a reference document in the record.

Mr. BOWMAN. Is this for Operation Teapot?

Mr. HOLIFIELD. This is entitled "1955 Test Series, R. L. Corsbie, Director."

Mr. BOWMAN. I gave another list of the 1953 series this morning which I also would like to have included.

Mr. HOLIFIELD. Without objection, that will also be included in the appendix of the record.

(The documents referred to are as follows:)

Civil effects test group—1955 test series

Program and project numbers	Program and project titles	Program director and project officers	Sponsor and performing agency
Program 30	Evaluation and documentation of radiological contamination.	R. W. Johnston, Director.	AEC.
Project 30.1	Automatic measurement and recording of radiation levels.	H. D. LeVine	NYOO/HASL.
Project 30.2	Utilization of telemetering techniques in evaluating residual radioactive contamination.	R. W. Johnston	BM.
Project 30.3	Development and evaluation of aerial survey techniques for fallout surface contamination.	H. D. LeVine	NYOO/HASL.
Program 31	Response of residential, commercial, industrial structures, and materials to nuclear effects.	B. C Taylor, Director.	FCDA/AEC.
Project 31.1	Damage to conventional and special types of residences exposed to nuclear effects.	P. A. Randall	HHFA/FCDA.
Project 31.2	Damage to commercial institutional, and industrial structures and contents exposed to nuclear effects.	Bruce G. Johnston	FCDA.
Project 31.3	Deleted		
Project 31.4	Comparison slab test	Walton Clark	PBS/FCDA.
Project 31.5	Thermal ignition and response of materials.	K. Laughlin	FCDA.
Project 31.6	Methods of determining yields and location of nuclear explosions.	W. Bascom	FCDA/AEC.
Program 32	Exposure of foods and foodstuffs to nuclear explosions.	E. P. Laug, Director.	FCDA.
Project 32.1	The effects on bulk staples	S. C. Rowe	FCDA/FDA.
Project 32.2	The effects on canned foods	C. Greenleaf	FCDA/FDA.
Project 32.3	The effects on meat and meat products.	R. H. Philbeck	FCDA/DA.
Project 32.4	The effects on semiperishable foods and packaging.	R. E. Hardenburg	FCDA/DA.
Project 32.5	The effects on frozen foods	H. P. Schmitt	FCDA/FDA.
Program 33	Biological and medical investigations	C. S. White, Director.	AEC/FCDA.
Project 33.1	Effects of overpressures on biological systems.	T. L. Chiffelle	BM/Lovelace.
Project 33.2	The effects of noise in blast resistant shelters.	F. C. Hirsch	FCDA/BM/SL.
Project 33.3	Deleted		
Project 33.4	Distribution and density of missiles from nuclear explosions.	I. G. Bowen	BM/FCDA/Lovelace.
Program 34	Shelters for civil populations	L. J. Vortman, Director.	FCDA/AEC.
Project 34.1a	Evaluation of indoor home shelters exposed to nuclear effects.	H. Birnbaum	FCDA.
Project 34.1b	Evaluation of outdoor family shelters exposed to nuclear effects.	do	FCDA.
Project 34.2	Investigation of rise time and duration of pressures in certain regions.	R. S. Millican	BM/SL.
Project 34.3	Structural behavior of group shelters under various blast loadings.	H. Birnbaum	FCDA.
Project 34.4	Nuclear effects on machine tools	L. Sparks	AEC/SFO.
Program 35	Utilities, services, and associated equipment exposed to nuclear explosion.	A. Stevenson, Director.	FCDA/AEC.
Project 35.1	Electric utilities	R. V. H. Wood	FCDA/AEC.
Project 35.2	Communications equipment	R. H. Williamson	FCDA/AEC.
Project 35.3	Deleted		
Project 35.4	Industrial and domestic gas storage and distribution:		
	(*a*) Liquid petroleum gas	P. W. Tucker, G. Corfield.	FCDA.
	(*b*) Natural and manufactured gas		FCDA
Project 35.5	Record storage equipment and facilities.	R. Bascom	FCDA/AEC.

Civil effects test group—1955 test series—Continued

Program and project numbers	Program and project titles	Program director and project officers	Sponsor and performing agency
Program 36	Mobile housing and emergency vehicles	J. C. Green, Director	FCDA.
Project 36.1	Utilization of trailer coach mobile homes following exposure to nuclear effects.	Ebe R. Shaw	FCDA.
Project 36.2	Operational use of civil-defense emergency vehicles.	F. McNea	FCDA.
Program 37	Fallout studies	K. H. Larson, Director	AEC.
Project 37.1	The factors influencing the biological fate and persistence of radioactive fallout.	R. G. Lindberg	BM/UCLA.
Project 37.2	The phenomenology of fallout at near distance.	L. Baurmash	BM/UCLA.
Project 37.3	Evaluation of inhalation exposures in rabbits.	G. V. Taplin	BM/UCLA.
Project 37.4	Deleted		
Program 38	Civil defense radef studies	R. Goeke, Director	FCDA.
Project 38.1	Civil defense monitoring techniques	F. Rehm	FCDA.
Project 38.2	Indoctrination and training of radef personnel.	R. Goeke	FCDA.
Project 38.3	Evaluation of civil defense radef instruments.	J. H. Tolan	FCDA.
Project 38.4	Comparative intensities of gamma radiation in various portions of structures under area.	F. Rehm	FCDA.
Project 38.5	Offsite radiological training exercise	C. T. Rainey	FCDA/C.
Program 39	Program instrumentation and photography.	R. L. Corsbie, Director.	AEC/FCDA
Project 39.1	Gamma and neutron radiation measurements.	L. J. Deal	BM/FCDA/EGG.
Project 39.2	Static and dynamic overpressure measurements.	R. S. Millican	BM/FCDA/SL.
Project 39.3	Thermal radiation measurements	B. O'Keefe	BM/FCDA/EGG.
Project 39.4	Technical photography:		
	(*a*) Documentary	S. A. Anthony	BM/LASL.
	(*b*) High-speed—blast biology	M. Palmer	BM/L'lace.
	(*c*) High-speed—physical phenomena.	B. O'Keefe	FCDA/EGG.
	(*d*) General and motion picture	O. D. King, Jr.	FCDA.
Project 39.5	Measurement and permanent recording of fast neutrons by effects on semiconductors.	B. Cassen	BM/LASL/UCLA.
Project 39.6	Measurement of initial and residual radiation by chemical methods.	G. V. Taplin	BM/UCLA.
Project 39.7	Physical dosimetry of neutrons and gamma rays in terms of rep.	Wright Langham	BM/LASL/OR.

NOTE.—Prepared by: R. L. Corsbie, Director, Civil Effects Test Group, Sept. 27, 1954. Revised Jan. 24, 1955. 2d revision Mar. 28, 1955.

Schedule of reports for civil effects tests Upshot-Knothole

Project	Title	Author	Agency
21.1	Basement and Backyard Home Shelters	Joseph Byrnes	AEC-FCDA.
21.2	Blast Effects on Dwelling Units	do	FCDA.
21.3	Air-Zero Locators	B. C. Taylor	FCDA.
22.1	Evaluation of Radef Survey Methods	V. B. Lamoureux	FCDA.
22.2	Evaluation of Radef Instruments	J. C. Greene	FCDA.
22.3	Radiological Hazards in Civil Defense	V. B. Lamoureux	FCDA.
22.4	Drug Irradiation Studies	E. P. Laug	FDA.
23.1	Biological Effectiveness of Ionizing Radiation within Shelters.	V. P. Bond	NRDL.
23.2	Bacteriological Studies on Dogs Exposed to Primarily Neutron Irradiation in Shelters.	M. S. Silverman	NRDL.
23.3	Long-Term Studies on Dogs Exposed to Primarily Neutron Irradiation in Shelters.	V. P. Bond	NRDL.
23.4	Effects of Neutron Irradiation on Sex-linked Lethal Mutation in *Drosophilidae*.	P. T. Ives	Amherst.
23.5	Effects of Neutrons on Spores of Smuts and Rusts	E. C. Stakman	University of Minnesota.
23.6	Mutations at Specific Loci in *Drosophila* Exposed to Neutrons.	G. H. Mickey W. K. Baker	LRNL
23.7	Chromosome Breaks in *Drosophila* Exposed to Neutrons	G. W. Beadle	Cal. Tech.
23.8	Lethal Neutron Dose for *Drosophila:* First Generation Lethality.	J. W. Gowen	Iowa State.
23.9	Neutron Dosage/Mutation Curve for Color Mutations in Wasp *Mormoniella*.	P. W. Whiting	University of Pennsylvania.
23.10	Effects of Neutrons on Chromosome Breaks in *Tradescantia*.	J. Kirby-Smith	ORNL.
23.11	Chromosome Breaks and Mutations in *Datura* Exposed to Neutrons.	A. F. Blakeslee	Smith.
23.12	Reverse Mutations in *Neurospora* Exposed to Neutrons	K. C. Atwood	ORNL.
23.13	Dominant Lethality and Sterility in Male Mice Exposed to Neutrons.	William Russell	ORNL.
23.14	Lethal Dose and First Generation Lethality in Two Strains of Mice.	J. W. Gowen	Iowa State.
23.15	Effects of Overpressure, Displacement, and Missiles on Animals and Dummies in Shelters.	J. E. Roberts J. Clark	Lovelace.
23.16	Chromosome Breaks in Neutron-irradiated Maize Seeds	Drew Schwartz	ORNL.
23.17	Dosimetry for Biological Experiments to be Conducted in Conjunction with AEC Shelter Testing.	E. Tochilin	NRDL.
24.1	Evaluation of Communal Shelters	R. L. Corsbie	AEC.
24.2	Physical Measurements of Gamma and Neutron Radiation in Shelter and Instrumentation Evaluation.	L. J. Deal	AEC.
24.3	AEC Shelter Instrumentation	A. R. Soffel	Vitro.
26.1 26.2	Physical, Mechanical, and Irradiation Evaluation of Civilian Vehicles Exposed to Atomic Attack.	S. A. Anthony F. J. Perella J. S. Jenner	AEC-FCDA.
27.1	Study of Off-Site Air-Borne Radioactive Materials, Nevada Proving Grounds. Gamma Fall-Out Originating from Upshot 2, 3, 4, 5, 7, and 8 at Various Distances up to 100 Miles From Ground Zero.	K. H. Larson	AEP/UCLA.
27.2	Radio-Ecological Observations on Components of the Biological Cycle as Influenced by Radioactive Contamination: Gamma Effects of Fall-Out on Selected Areas Contaminated by the Upshot Knothole Series.	R. G. Lindberg	AEP/UCLA.
28.1	Test of a Radiation Telemetering System	R. W. Johnston F. C. Legler	AEC.
29.1	Comparison and Evaluation of Gamma Radiation Dosimetry Methods.	G. V. Taplin	UCLA.
29.2	Measurement of Fast Neutrons by Effects on Semi-Conductors.	Benedict Cassen	UCLA.
29.3	Evaluation of Dosimetry for Civil Effects Programs	R. L. Butenhoff	AEC.
29.4	Effective Energy of Residual Gamma Radiation	A. H. Dahl	University of Rochester.

Mr. FASCELL. I have this one question, Mr. Chairman. Mr. Bowman, do you know of any study that would give this committee information on how long it would take to prepare a reasonable protective shelter program for all of the target areas in this country?

Mr. BOWMAN. I don't think any such study has been made.

Mr. FASCELL. Nor the cost of such a program.

Mr. BOWMAN. Well, I made a figure this morning just to amuse myself, not to amuse myself but to inform myself.

Mr. FASCELL. Just sort of a guestimate?

Mr. BOWMAN. Yes, sir. The statement was made that there was 60 million people in urban areas and this morning Mr. Cohen said $300 per person and the product of those is $18 billion.

Mr. HOLIFIELD. That is about half of 1 year's appropriation for our military force.

Mr. BOWMAN. Yes.

Mr. HOLIFIELD. Our military force program is for the protection of the people that are behind the lines.

Mr. BOWMAN. The same people, that is correct.

Mr. HOLIFIELD. To save the people of our Nation as well as the independence of our Nation and even though it would cost $18 billion, it could not all be done at once.

It would have to be spread over a period of years and it might be well that 2 or 3 billion dollars a year might be devoted to this program if it is as important as the lives and the abilities to withstand this type of a shock of 50 to 75 million people seems to be to this committee.

Mr. BOWMAN. I think so.

Mr. HOLIFIELD. It might be that it would be important enough to increase wise and judicious and well thought out expenditures in this field of protection of our people in our urban centers for the benefit of the Nation.

Would you say that this is a field that needs to be filled with action?

Mr. BOWMAN. I believe it is. I just introduced by reference up to 100 studies that had been made in the field.

Mr. HOLIFIELD. Have enough studies been made for us to get on with the program or are several years more studies needed?

Mr. BOWMAN. I think that the studies which will still be made will modify the program but I think we have enough studies so we can make a start.

Mr. HOLIFIELD. That includes the area of providing reasonable shelters and providing protection against radiation and decontamination and all of the things that are necessary to have a reasonable and adequate civil-defense program within the bounds of the peril that we are facing?

Mr. BOWMAN. It does.

Mr. HOLIFIELD. So you would advise then as a man of professional background in this field that we get on with the job of protecting the people, would you?

Mr. BOWMAN. I think it is necessary that something be done to protect the people.

Mr. HOLIFIELD. Are there any further questions of Dr. Bowman?

Mr. RIEHLMAN. No, sir.

Mr. HOLIFIELD. You had some slides. I believe it would be good for the committee to see those.

At this time let me say for the benefit of the other witnesses that we promised to place Mr. Fitzgerald on next as he has to catch an early train and it looks as though we will be unable to have the other two witnesses at this session, as the bells for the House have been ringing.

We would like to ask Mr. Kirkpatrick and the representative of the Housing and Home Finance Agency, Mr. Chapman, to come back at another hearing which we will notify you of as it looks like the time will be such that we can't take you on today.

I can say we can hear you the first thing tomorrow morning if you will be back. We will have Mr. Fitzgerald on as the next witness after the slide.

Mr. BOWMAN. I first mentioned an underground pipe shelter with open ends and ramp entrances. The ends here were of concrete. This was subjected to a number of shots. I know you are in a hurry so I will go through these rapidly. All right, the next one, please. This shows the shelter under construction. It was 90 inches in diameter and open at the ends. This shows the ramp. It was not paved and under Nevada conditions, the bombs blew sand into the pipe itself. There were these concrete headwalls, the ramp entrance and the open shelter here. The earth was mounded up to this level, before the test was made.

This slide shows there were under four shots. Under the second shot it shows a few cracks. Under the third shot some more, and under the fourth still more. Also the sand had flowed in but the pipe itself was still intact.

These slides show some of the cracks which occurred in the roof of the concrete pipe but otherwise it was undamaged.

Then when it came time to build the second set of shelters, we had some tests made in the blast tube at Aberdeen. Tests can be made on three scales. They can be made in the shock tube. They can be made with high explosives and they can be made in the field under atomic-bomb tests and they become increasingly expensive. So first a small model was built of the shelter itself, the vestibule entrance and the ramp, and it was put here and tests were run.

It is in position there for the test. The next slide.

This is an architectural drawing. It was one of the shelters that was built in the second series with a double ramp entrance. The one shown here had a single ramp, a vestibule, and a concrete pipe shelter here.

On this slide, we put some dummies inside it, which did not fare too well as you will see from the next shot.

Mr. HOLIFIELD. How far was this from point zero?

Mr. BOWMAN. I think about a thousand feet, but I would have to look that up.

Mr. MORGAN. What was the pressure, the overpressure?

Mr. BOWMAN. It shows on the next slide. I think it was in the neighborhood of 15 to 20 pounds per square inch in the shelter. At one point in the ramp there it ran very high due to the reflection. But inside the shelter, while the pressure came up to the pressure outside, there was a very slowwise time and that would have been quite advantageous from the point of survival of persons.

This slide is just one additional slide. This is next to the last. This is the shelter that Mr. Cohen mentioned this morning that was paid for by FCDA and tested jointly by AEC and FCDA. This is the entrance. The shelter is here and the cover has not yet been put on. The earth cover is 4½ feet.

And there was the view inside this shelter.

It was a concrete box. In some of the material you read this morning it was stated that there was an escape hatch, a steel door and an entrance way which is filled with sand, an emergency exit so if the main entrance is blocked, this door can be opened, the sand comes down and it is possible for many persons to escape.

I thought it would give you an idea of the type of shelters we were talking about in our testimony this morning.

Thank you, sir.

Mr. HOLIFIELD. Thank you, Dr. Bowman.

Mr. Morgan has 1 or 2 questions and we will conclude the hearing.

Mr. MORGAN. Dr. Bowman, would you say that two of the important considerations to an evacuation policy would be the reaction of the individuals or the masses to an alert and also the initial delay before evacuation could be initiated?

Mr. BOWMAN. Would you repeat the last part of that, please?

Mr. MORGAN. The initial delay or the time it would take.

Mr. BOWMAN. How much time you have after you get your alert before the attack comes you mean?

Mr. MORGAN. Just the time it takes to get the people out of building and flow of traffic and people moving into evacuation grounds.

Mr. BOWMAN. Those would certainly be factors that would be of importance in determining how soon your people could be at safe areas if that is what you mean.

Mr. MORGAN. Do you know of any studies that have been made on the individual reaction to disaster or the reaction of the masses to disaster?

Mr. BOWMAN. Yes. I think the National Research Council has a group that studies disasters. For example, as soon as there is a disaster they will send in a trained team. They sent teams into South Amboy where there were explosions.

They sent a team to Worcester immediately after the tornado there.

They sent teams to these points to find out how people do react under disaster conditions.

I think some of the people that have information as to the results of those studies could assure you that much has been done by the armed services also in studying the reaction of population to disaster conditions.

Mr. MORGAN. This was one of the projects, Mr. Chairman, that I believe that the Department of HEW had on their list of projects and did not complete because of lack of funds. One of the assumptions states that the sequence and performance of events and duties preceding the signal to evacuate includes rational behavior by individuals during the actual evacuation.

Another fact on evacuation is that the study made under FCDA contract on the Milwaukee metropolitan area stated that one-half hour elapsed before the evacuation was fully underway.

Mr. BOWMAN. I think that the fact that people knew that was a test and not a real thing would add a lot of minutes to the time it would take them to get moving.

Mr. HOLIFIELD. It also might have something to do with the calmness with which they moved once they got moving and the absence of panic that would occur in a real test.

Mr. BOWMAN. That is right.

Mr. MORGAN. In view of these areas and doubt and uncertainty and in view of what has been reported in the nswspapers on the progress of Russia on the development of the ICBM in which we will receive only 30 minutes of warning at the most, do you think that more emphasis should be placed on shelter at that time rather than evacuation?

Mr. BOWMAN. If we are to deal with the ICBM, then shelter is necessary in order to take care of people who are in a zone away from

ground zero. If an attack is going to be with an intercontinental ballistic missile, you will have an area at the center that is wiped out. You will have some area in which people will survive in shelters. You will have another area outside of that where they will need protection against fallout. Under those circumstances you would need shelters if people are to survive.

Mr. MORGAN. But in view of the inaccuracies that might be involved in an ICBM, should we not discount this point zero, not put as much emphasis on it and plan on shelter close into point zero?

Mr. BOWMAN. You have to cover your area with shelters because you don't know where ground zero is. That is very true.

Mr. HOLIFIELD. Your reasoning on the ICBM certainly is applicable to coastal cities that might be at this time subjected to missiles launched from submarines, at a distance of a 100 to 200 miles off the coast.

Mr. BOWMAN. It is.

Mr. HOLIFIELD. There is no warning time for evacuation in that instance and therefore the safety of your population would depend upon shelter rather than evacuation because of the lack of warning.

Mr. BOWMAN. That is correct.

Mr. HOLIFIELD. Thank you very much, Mr. Bowman, for your testimony. It has been very valuable to this committee.

We are going to proceed with the next witness, J. Edmund Fitzgerald, manager of the applied dynamics group, mechanics research department, American Machine & Foundry Co. of Chicago, Ill. This firm currently has contracts with the Air Force for the construction of blast-resistant nonpermanent shelters. And we are asking Mr. Fitzgerald as a representative of this firm to present his ideas and the ideas of his group on a shelter policy for civil defense.

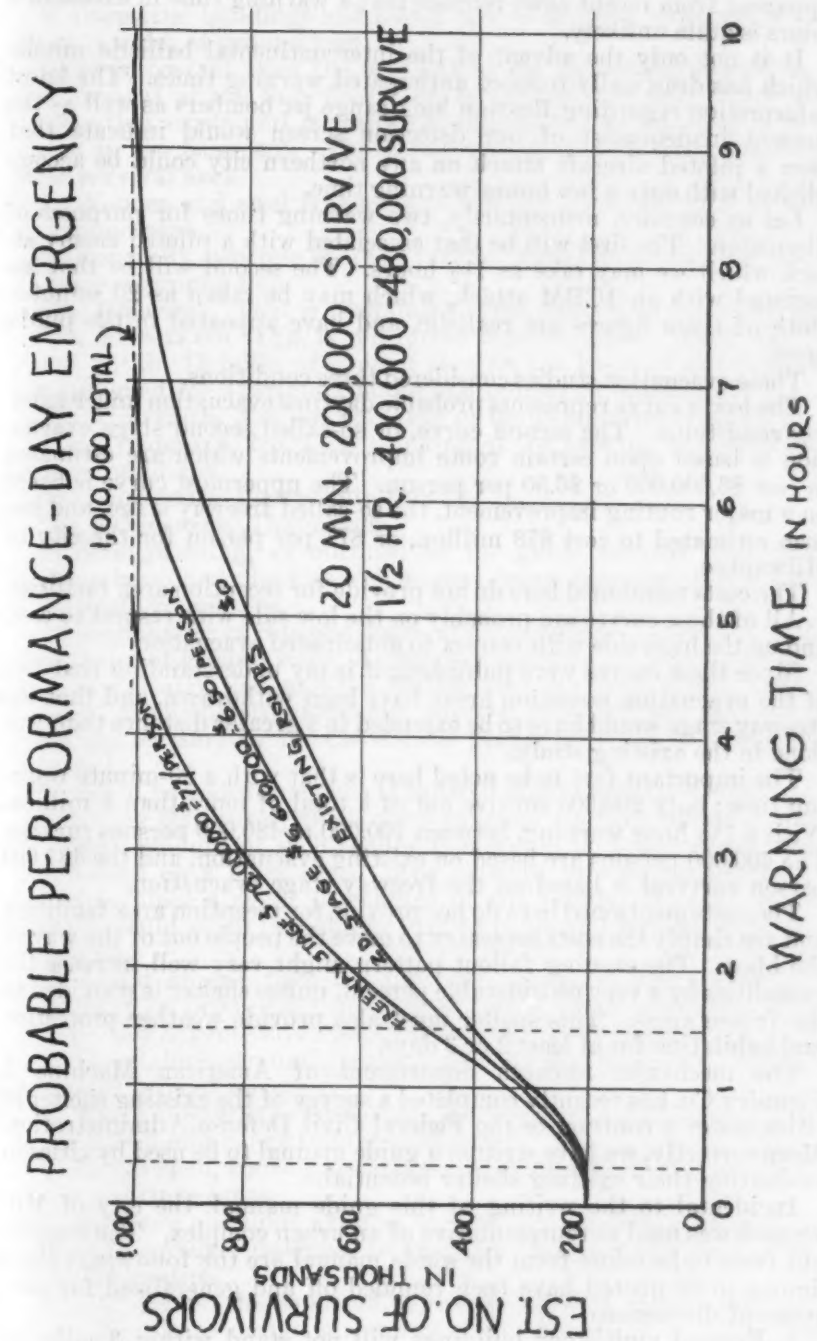
Mr. FITZGERALD. Mr. Chairman, in order to complete this I think the best thing is if I go through a whole prepared statement before answering questions.

STATEMENT OF J. EDMUND FITZGERALD, MANAGER OF THE APPLIED DYNAMICS GROUP, MECHANICS RESEARCH DEPARTMENT, AMERICAN MACHINE & FOUNDRY CO., CHICAGO, ILL.

Mr. FITZGERALD. As a brief background, I might say, we have participated in Operation Greenhouse, Buster-Jangle also, Knothole, Teapot in the design of structures to withstand blasts in studies to find out what happens to structures as well as more general structures. We have acted as consultants to the Air Force in the design of blast-resistant construction of structures.

Many studies have been made to date on the feasibility of evacuation of an urban complex as a step toward survival in the large megaton H-bomb era. Perhaps the most thoroughgoing study, which is in fact still in progress, is that connected with Milwaukee, Wis., a city with 1,010,000 population. This includes the surrounding suburbs.

A report was published a while ago under a contract with the Federal Civil Defense Administration. The results of that study can be graphically shown in this figure.


PROBABLE PERFORMANCE-DAY EMERGENCY
1,010,000 TOTAL
20 MIN. 200,000 SURVIVE
1½ HR. 400,000-480,000 SURVIVE
EST NO. OF SURVIVORS
IN THOUSANDS
1000
800
600
400
200
0
0
1
2
3
4
5
6
7
8
9
10
WARNING TIME IN HOURS

Although the curves extend out to 10 hours, I think that it is quite apparent from recent news releases that a warning time in excess of 2 hours is quite unlikely.

It is not only the advent of the intercontinental ballistic missile which has drastically reduced anticipated warning times. The latest information regarding Russian long-range jet bombers as well as the present inadequacies of our detection screen would indicate that even a piloted aircraft attack on any northern city could be accomplished with only a few hours' warning time.

Let us consider, momentarily, two warning times for purposes of discussion. The first will be that associated with a piloted enemy attack which we may take as 1½ hours. The second will be that associated with an ICBM attack, which may be taken as 20 minutes. Both of these figures are realistic, and have appeared in the public press.

These evacuation studies considered three conditions.

The lower curve represents probable daytime evacuation under existing conditions. The second curve, or so-called second stage evacuation is based upon certain route improvements which are estimated to cost $6,600,000 or $6.50 per person. The uppermost curve is based on a major routing improvement, the so-called freeway stage, and has been estimated to cost $78 million, or $77 per person for the city of Milwaukee.

The costs mentioned here do not provide for reception area facilities.

All of these curves are probably on the low side with respect to cost, and on the high side with respect to anticipated evacuation.

Since these curves were published, it is my understanding that two of the evacuation reception areas have been withdrawn, and that the freeway stage would have to be extended to a greater distance than was done in the existing study.

The important fact to be noted here is that with a 20-minute warning time; only 200,000 survive out of a total of more than 1 million. With a 1¼ hour warning, between 400,000 to 480,000 persons survive. The 400,000 persons are based on existing evacuation, and the 480,000 person survival is based on the freeway stage evacuation.

The costs mentioned here do not provide for reception area facilities, and are simply the costs necessary to move the people out of the way of the blast. The ensuing fallout pattern might very well increase the casualities by a very considerable percent, unless shelter is provided in the fringe areas. This shelter must also provide weather protection and habitation for at least 2 or 3 days.

The mechanics research department of American Machine & Foundry Co. has recently completed a survey of the existing shelter in cities under a contract to the Federal Civil Defense Administration. More correctly, we have written a guide manual to be used by cities in evaluating their existing shelter potential.

Incidental to the writing of this guide manual, the city of Milwaukee was used as representative of an urban complex. The important facts to be taken from the guide manual are the following; these figures to be quoted have been rounded off and generalized for purposes of discussion:

1. Framed multistory buildings will not stand within 3 miles of ground zero. I am thinking here of nothing less than 20 to 50 megaton range bombs, which is the only range we considered.

2. Wall bearing multistory buildings will not stand within 13 miles of ground zero.

3. Industrial buildings and homes will be severely damaged within 10 to 15 miles of ground zero.

More important than the survival of the structures themselves is the survival of the first floor; for, in general, the only practicable shelter that exists and is readily accessible in any building is to be found in the basement. The pertinent points with respect to first-floor survival are:

1. Wooden and steel frame floors will not survive within 13 miles of ground zero.

2. Generally, concrete floors of various types will not survive within 15 miles of ground zero.

Mr. HOLIFIELD. That is assuming it is not steel reinforced I suppose.

Mr. FITZGERALD. This is reinforced concrete slabs. They will not stand within 15 miles of ground zero on the basis of the way they are designed for apartment house and industrial buildings.

Mr. HOLIFIELD. Are you thinking of the tipup type of slab?

Mr. FITZGERALD. No, I am thinking of the existing ones they have now in buildings.

Mr. HOLIFIELD. Poured into forms?

Mr. FITZGERALD. That's right.

3. Strengthening, as outlined in the guide manual, will enable wooden beam and plank as well as steel frame floors to survive within 4 miles of ground zero.

Strengthening of concrete floors will enable them to stand to within 10½ miles of ground zero. A glance at the map of Milwaukee shows only too clearly that existing shelter does not exist within the city limits. Even the strengthening referred to would not improve the situation measurably for the 800,000 people to which it would be of no avail.

It might be added that even if isolated shelter areas could be located in existing structures which were superior to those outlined above, the small amount of such shelter that would be found could hardly be utilized on a mass basis. Any attempt to separate evacuees in order to place a small percentage of the people into that existing shelter would in all probability lead to panic and a rather impossible condition.

It would appear from the previous comments that the technical feasibility of protective construction should be investigated. I have broken down protective construction into three classes.

1. Small, high-strength, underground shelters to be used to within 1 mile of ground zero.

2. Medium-strength, large-span, above-ground shelters to be used in the 2- to 5-mile range from ground zero.

3. Large-span, above-ground, fallout shelters to be used in the low-pressure fringe areas.

Before any questions arise as to how one predicts a ground zero, I shall ask your indulgence to postpone this question until later in this presentation.

Let us discuss the small underground shelters. Technically, it is quite feasible to design an underground shelter or divide a larger

shelter into, let us say, 12- by 20-foot rooms so that the shelter will survive within the fireball radius. Actually a 12- by 20-foot plan size room with 4-foot thick reinforced concrete walls and roof buried so that the top of its roof is flush with the ground, can survive more than 500 feet inside the fireball radius. This design incorporates no unusual features, and is simply a result of a straightforward dynamic limit design analysis. It might be added that it is feasible technically to construct small shelters of this type which will survive underground well within the fireball so long as they are not in the actual crater formed by the bomb.

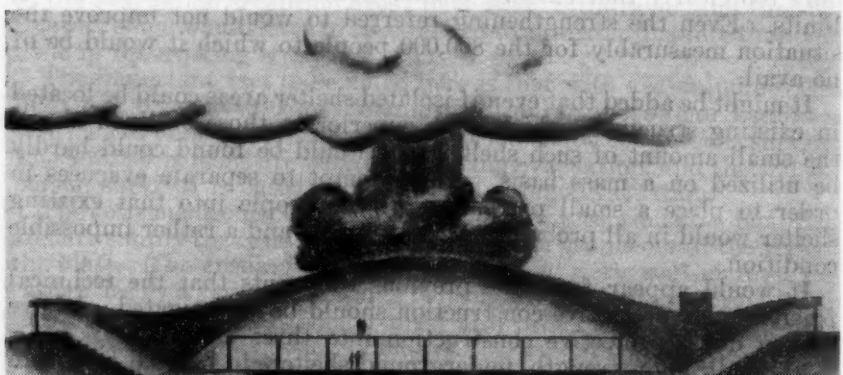
Mr. ROBACK. Dr. Bowman pointed out that the structures might survive but not the persons.

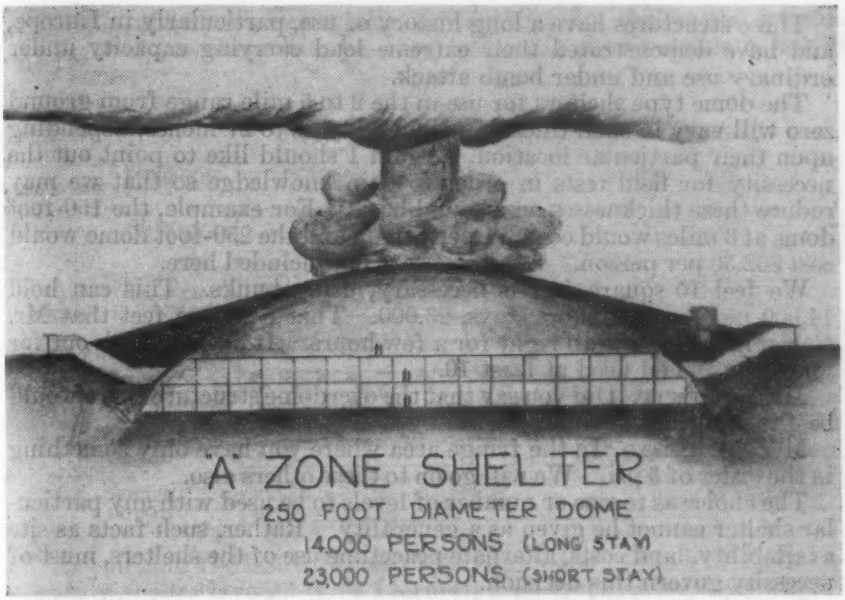
Mr. FITZGERALD. The persons might survive if they were not standing. If the persons were lying down they could take an enormous amount of acceleration.

It has been shown on shipboard studies and tests in centerfuges and various other results. His [Dr. Bowman's] shelters did not have doors. These (A. M. F.'s) do. I don't think that would be a major problem.

Larger underground shelters at a greater distance from ground zero are also technically quite feasible and have the further advantage that they may be used as underground storage or garage facilities to some extent.

Medium strength, large, above-ground shelters are quite practical in the 2- to 5-mile range from ground zero. The figures here show sketches of two such structures. One is for a 150-foot diameter concrete dome with some earth cover for increased radiation protection.





I may differ here with Mr. Cohen in that it may be true that when you go too thin in concrete you need additional radiation protection but we feel that earth is cheaper than concrete and the total cost comes out to the good.

You may note that there are two floor levels inside the structure. We appear to have a lot of waste space up here, but we do not consider it waste space. In a period of several days when people may be sheltered here, the air there may be badly needed.

The second figure shows a 250-foot diameter concrete dome with 3 floor levels inside it. Both of these structures have been analyzed and their design is generally considered to be actually on the conservative side. Full-scale tests should lead to increased knowledge of their behavior and a probable reduction in thickness, and hence, cost.

Since this point, cost, has been brought up, it might be well to discuss the costs associated with these structures along with the technical aspects.

These dome shelters could be used not only in the 2 to 5 mile ring, but may also be used quite effectively for the fringe areas fallout shelters. We have talked about getting the people out of the cities. We need to put them in something.

Existing cost records of recent concrete shell construction indicates that the superstructure for such a dome in the fringe area should not exceed $4 per square foot of floor area and is only 4 inches thick with 3 feet of earth cover. Our analysis would indicate that a two level dome in the fringe area including the cost of the shell, earth cover, foundation, and interior floors, etc., should not exceed $43 per person, allowing a rather liberal 10 square foot per person for occupancy, that is, long-term stay.

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These structures have a long history of use, particularly in Europe, and have demonstrated their extreme load carrying capacity under ordinary use and under bomb attack.

The dome type shelters for use in the 2 to 5 mile range from ground zero will vary in shell thickness from 8 inches to 27 inches, depending upon their particular location. Again I should like to point out the necessity for field tests in order to gain knowledge so that we may reduce these thicknesses on a sound basis. For example, the 150-foot dome at 3 miles would cost $61 per person and the 250-foot dome would cost $62.50 per person. Land costs are not included here.

We feel 10 square feet is necessary, using bunks. This can hold 14,000 persons, for short stays, 23,000. That 6 square feet that Mr. Cohen mentioned is all right for a few hours. It doesn't work out for long stay. You need at least 10.

Mr. HOLIFIELD. Did you say that the overdome structure there would be 4 inches thick?

Mr. FITZGERALD. In the fringe area where you have only something in the order of 5 psi. We will go on to these others also.

The choice as to size or number of levels to be used with any particular shelter cannot be given as a generality. Rather, such facts as site availability, land costs, alternate peacetime use of the shelters, must of necessity govern this decision.

It might be added that in downtown areas the etremely high land costs might lead to a solution where one uses a much more expensive underground shelter, but here the total cost might be less than using a less expensive aboveground shelter on extremely high priced land.

None of the above cost figures are probably the actual costs if a large-scale shelter program should be embarked upon. It is quite obvious that considerable savings could be made by the use of specially designed, reusable forms and engineered construction methods.

The cost comparison of a dome type structure with an arched shell or a rectangular-type structure can, nevertheless, be crudely made. Studies have shown that for the coverage of large areas, the use of a dome will invariably be less than that of an arched shell or a rectangular structure by one or two orders of magnitude. On moderate priced land, the dome will still be cheaper even though the land use is less efficient.

That is 30 pounds per pressure over pressure. Land costs are not included here. We will go on to those later.

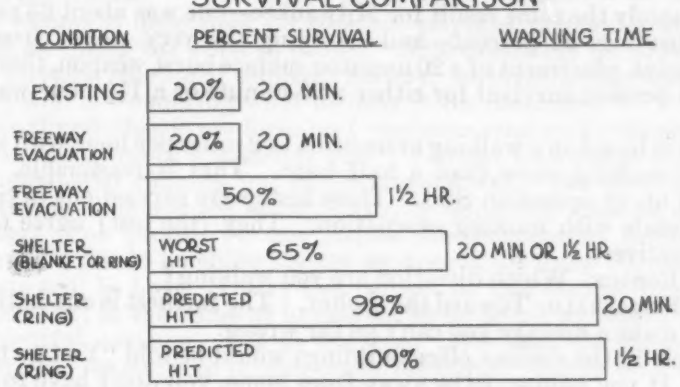
The combination of small high pressure underground structure perhaps similar to those tested by FCDA in Nevada costing $400 per person on a 10 square foot basis, and large fringe area shelters costing as low as $35 per person should lead to a complete shelter program for the entire country costing approximately $50 per person.

This lower figure should be possible on a national basis and leads to a total figure of $8 billion for the Nation as a whole.

Spread out over a 4-year building program, this would amount to $2 billion a year, or approximately 6 percent of the defense budget per year.

It would certainly seem that a defense effort which although eminently successful in destroying an aggressor, allows 50 to 100 million citizens to be annihilated is hardly a successful defense. Before anyone would consider seriously such an expenditure, however, we should look at the survival comparison between evacuation and shelter.

This graph shows a comparison of survival for shelter and evacuation. Before commenting on the numbers, I should define a few of the terms.



As you note, the last three bars apply to shelter. I have defined two types of shelter layout. One I term ring shelter, and the other blanket shelter. By ring shelter I mean a layout whereby one predicts an anticipated ground zero. The shelters are then built in the 1½- to 5-mile annular ring surrounding this aiming point.

In general, this philosophy has been used in the survival studies carried out by FCDA. The aiming point has generally been chosen to maximize the damage that an H-bomb could inflict on a city based on population density.

If one relies upon protective construction in such a ring, however, it will readily become apparent to any aggressor that a new aiming point should be chosen so as to maximize the damage upon the shelters. In other words, no matter how clever one is at moving shelters away from ground zero, this very condition will create a new condition for ground zero.

With this previous thought in mind, we have considered another shelter pattern which I refer to as blanket shelter. The philosophy here is to simply place these shelters more or less uniformly spread throughout the entire 5-mile ring covering the greatest population density in Milwaukee. It is apparent that to do this might seem rather heartless and cold blooded insofar as one could interpret this as condemning several thousands of people to a sure death in the event of an attack. However, before leaping to such a conclusion, one should consider the fact that we do not know the enemy's aiming point and we do not know his aiming accuracy. Hence the most we can do is attempt to minimize the casualties assuming the worst condition of attack. Now let us look at this graph again.

Starting from the top, if we do nothing in our typical example city, Milwaukee, there will be only a 20-percent survival; that is more than 800,000 Milwaukee citizens will be killed. Now if we spend the $78 million for the improved freeway evacuation method, the results of the Wilbur Smith study show that for a 20-minute warning time which is insufficient for a mobilized evacuation to get rolling, we again will have only a 20-percent survival.

In the case of a 1½-hour warning time and the expenditure of $78 million, the survival will be increased to 50 percent, or approximately 500,000 persons.

The last three bars pertain to shelter survival. Using either a blanket- or a ring-shelter method, the two cases happen to give approximately the same result for Milwaukee—one was about 63 percent the other was 64 percent—and assuming the very worst, from our standpoint, placement of a 20 megaton surface burst weapon, there will be a 65-percent survival for either a 20-minute or a 1½-hour warning time.

This is based on a walking evacuation at 2 miles per hour with no one person walking more than a half hour. That is reasonable. It is backed up by operation Scat. These tests were carried out in Seattle and Mobile with walking evacuation. They (the test) agree that is conservative.

Mr. ROBACK. Which direction are you walking?

Mr. FITZGERALD. Toward the shelter. The farthest is one-half mile. If you make a mistake you can't go far wrong.

People in the various office buildings would be told "You go to this one." If you happen to be away from home, you don't have to know whose car shall I get in to evacuate. Run with the crowd to the nearest shelter.

Mr. FASCELL. What happens if you meet everybody else in town at the same shelter?

Mr. FITZGERALD. In general this will not happen because the average person working in the city knows which shelter he can go to. There will be at 5 or 10 percent fringe which is not where they are supposed to be and these shelters could take it and we reduce the space from 10 square feet to 9 square feet.

I don't think this is a major problem.

If, however, it is true that we can rely on the predicted ground zero as defined by the FCDA, the use of ring-type shelter will provide 98 percent survival with 20-minute warning time and complete or 100 percent survival with 1½-hour warning time.

I do not believe these last figures because I don't think there is a ground zero we can talk about so the 65 percent is it.

Total cost figures for these shelters cannot be given immediately, but I think it reasonable to state on the basis of uniform costs given previously, that the entire shelter program should not exceed the freeway stage evacuation program in cost.

Far more importantly, however, the shelter program provides immeasurably greater advantage in that many additional thousands of human beings will survive.

To summarize, present technology of warfare using large megaton bombs invalidates the centuries-old principle that if the Armed Forces in the field are successful in holding the line, the civil population is safe. This change started in World War II on a limited scale. Evacuation under existing conditions would lead to as much as 80 percent casualties in the event of a short warning attack. Improved evacuation will be costly and still lead to as much as 60 percent casualties.

It is poor comfort to the civilian population to that extent to note that the enemy has been annihilated but that only 20 to 40 percent of our population has survived.

Hence priority should be given to insure survival of our civilian population and resources through either 1, prevention of war or failing this, 2, insurance against total destruction.

The first, prevention of war is subject to the vagaries of persons beyond our control.

The second is dependent on concrete physical principles and can succeed assuming the worst in people. Now to add my bit of emotion to an already emotional subject, namely, survival along with Mr. Fascell who is wondering what he does in his basement.

When thunderheads are forming I prefer a sound roof over my head to the incantations of a medicine man. I prefer a roof over my head to my chance of running out of the storm's way. We do not know the warning time nor the enemy's aiming point nor enemy's aiming accuracy. For people we can reduce the 20-megaton bomb to a standard Nagasaki bomb by shelter we are taking away his strength. Someone will be hurt. Thirty-five percent on this blanket basis will be wiped out; in the name of humanity let us do all we can to reduce the frightful carnage. Let us not run. We have the knowledge. We have the resources to protect ourselves today. Let us do it today. That is the end of the prepared statement.

Mr. HOLIFIELD. Thank you very much for your testimony, Mr. Fitzgerald. Your firm stands behind you in this statement, does it?

Mr. FITZGERALD. I hope they do. I haven't called them about this statement.

Dr. Levan Griffis, Dr. Eubanks, Mr. Morrison, and the various people who have studied this stand behind me. My firm stands behind me in that our firm is going underground with our own plant. Our president stands behind me in the general philosophy expressed herein.

Mr. HOLIFIELD. Who's the president of your firm?

Mr. FITZGERALD. Mr. Morehead Patterson.

Mr. HOLIFIELD. You say that your firm is going underground?

Mr. FITZGERALD. We have secured options on 2,600 acres of land in Huntsville, Ala. We have designs prepared and costs estimated. There is 600 feet of limestone cover over this plant. It might be a million square feet. I might add the total cost of this plant, based on calculations and estimates given by Mason & Hanger, an outfit who put in the Hudson River tubes and several other tunnels and know this thing is $5.50 a square foot, a figure actually lower than the figure for which we could put a plant above ground.

This is unusual due to the particular circumstances at Huntsville, it makes commonsense and saves us money to go underground and we will have a high degree of protection against atomic bomb.

Mr. ROBACK. In spite of the proximity of the arsenal.

Mr. FITZGERALD. They can hit the arsenal. We are fine if they do that. We are worried about missing the arsenal.

Mr. HOLIFIELD. At least you have testified that your firm is going to do something about this hazard. They believe it is enough of a reality that you are making a move toward protecting your operation.

Mr. FITZGERALD. Yes. For example, the only way to convince people of an industry's willingness is if they spend their own money.

In that point we do believe that, yes, and we are going underground.

Mr. ROBACK. Is not a proper question to be asked, in considering

your shelter theory, whether we ought to have individual family shelters or multitype shelters?

Mr. FITZGERALD. It is a proper question to ask. Can anyone come up with an individual family shelter costing $50 a person? What do you do with the million people downtown in the cities? They can't run home to their family shelter. I have taken care of that by building a wall, strengthening my floors and approximate that I can take about 20 p. s. i. in my basement. I have all the utilities to turn off, plus mineral water, in the bottles there. I am 32 miles from the center of Chicago, 60 miles from the steel yards. I consider this reasonable protection for myself and my family. It cost me nothing. All I had to do is make one wall stronger to support these first-floor beams. But I don't see how on the basis of family shelter you could protect a city as a whole.

Generally I am 32 miles from home during about 10 hours of the day.

Mr. ROBACK. The point I wanted to bring out by your answer is that while we talk about the concentration of population in cities, we talk about shelter programs which are more suited to country areas.

Mr. FITZGERALD. I am talking about cities.

Mr. ROBACK. I don't mean in your thinking. I mean when we talk about the family, what they can do shelterwise.

Mr. FITZGERALD. That may be nice for those people at home. But most of these suburban areas—take the city of Highland Park where I live, it has about 18,000 people. You take this large 250-foot span dome. This particular dome can shelter 14,000 persons for a long stay and 23,000 persons for a short stay. Let us say this particular structure at a cost of some $62.50 per person, could provide more than adequate shelter—I mean blast, initial thermal radiation and fallout radiation—for the entire city.

We have the area for it.

Suppose it is placed in Highland Park. Nobody would have to go much more than a half mile or mile to get there. They could do it well within one-half hour warning time. The people would be there, medical facilities would be there, food for survival would be there. I don't know how you can talk people into reaching into their pockets and spending thousands of dollars more on their home to shelter themselves.

You can't get them to spend that to improve their schools. How can you get them to do it for something so intangible as this? It must be done by the Federal Government.

Mr. ROBACK. You are making another point implicit in your shelter theory that building shelters for large groups of people you thereby provide an opportunity to utilize those shelters in ordinary times for commercial purposes to a large extent.

Mr. FITZGERALD. I would not say commercial purposes, but civic purposes.

Mr. ROBACK. Revenue-producing purposes.

Mr. FITZGERALD. No. At a small additional cost there is no reason if using one-floor shelter for the smaller communities or spread out, could not be used as a roller-skating rink or generalized auditorium or a municipal basketball court. There are many other uses that could be made for these.

Mr. FASCELL. Mr. Chairman, I wanted to get back to this overall cost for the Nation of $50 per person based on 10 square feet of construction for each person. Was that cost for the structure exclusive of land?

Mr. FITZGERALD. No, we will say for the Nation as a whole, because everybody in the Nation will not be in a shelter. The cost we have given, like the specific cost of $62.50 for one shelter, includes the foundation, the floors, the entryway, the ventilation, the shell, the earth cover, the internal electrical and mechanical equipment. This is a complete cost except for land. As far as land, I have no way myself of knowing what land would cost.

Whether it is condemned park property or just what it is. I don't know and I have not made an attempt to put it in there. I feel $50 a person, including land, is probably valid.

Mr. FASCELL. What additional equipment would be required in order to make the shelter usable?

Mr. FITZGERALD. Additional equipment beyond what we have included already?

Mr. FASCELL. What have you included in your cost estimate?

Mr. FITZGERALD. Nothing additional. If you have doors, if you have ventilation, if you have self-contained electric power.

Mr. FASCELL. What kind of ventilation are you talking about?

Mr. FITZGERALD. The only ventilation we see as necessary is essentially this. You might put it on the basis of manholes coming up to the surface. You see this thing [on the figure]. It is a rather thick cylindrical tower that would stand any pressures you care to design it to. This was designed for 30 p. s. i. That is steel doors that can be operated from the inside. They are shut. The people move in. With this additional volume of air which I like to call an air reserve you can keep those shut until the fallout is essentially down, 36 hours, let us say, at which point you can open up these side doors and take in air and nothing more than an ordinary fiber glass filter will keep that air pure.

Actually you probably don't need anything because the small amount of fallout circulating in the air, the small amount of dust particles circulating in the air at that time would only raise the radioactivity inside by a very trifling amount.

Mr. FASCELL. You don't need any air circulation; all you need is air?

Mr. FITZGERALD. This includes air circulation, of course, with those people you need a circulator. Just mechanical construction, self-contained power unit. It relies on nothing from the outside.

Mr. BREWER. What would be the cost of blanketing Milwaukee with that type of shelter?

Mr. FITZGERALD. We came out with a cost for the city of Milwaukee—and again we did not have land costs. The most I had here was a map of Milwaukee with various park areas, and so forth, only in the very downtown areas would you have to go underground or tear down buildings. Other than that, except for 2 of these, these turned out to be in the order of the 250 foot size. 90 of them would be needed or 60 of the others [250 foot size]. We have not optimized this yet. You can do what you want. It would appear that a total cost would be somewhere in the neighborhood of $65 million and would take care

of Milwaukee as opposed to the $78 million to put in the freeway to evacuate which would not provide as great a survival for that.

Mr. FASCELL. What is a long stay?

Mr. FITZGERALD. A long stay we are talking about meaning perhaps the better part of a week. Where the people have to have room for bunks and to lie down and circulate a bit without breaking down. We also suggest that the 14,000 people do not have access to one another but in this large 250 foot dome there would be 18 entrances and those entrance costs are included here. That would be filled by people ordinarily walking in the same way that they fill a large auditorium. That could be done in 10 minutes. With 18 entrances I would suggest that you have partitions occasionally. Instead of 14,000 people if you divided that up, so each entry way goes into one area with an ordinary partition, separating them, you would have less than a thousand people in a group. So in case panic did start, it would not be as bad. With a thousand people you don't get the chance of panic in there as much as you do with 14,000 exposed to one another.

Mr. FASCELL. Is your theory still valid if you increase your length of stay to 30 days?

Mr. FITZGERALD. I wouldn't want to stay in there 30 days although I might. I served in the submarine service for 2 years and I did not have more space and air than that and we did stay up to periods of 30 days. It is not perhaps impossible and it would take training people. But I can't conceive of why a person should have to stay in there 30 days.

Mr. FASCELL. I don't know either now.

Mr. FITZGERALD. This might range from periods of 3 to 5 days.

Mr. FASCELL. It might rain tomorrow.

This includes the storage space necessary for foods and water, washing, and laundry.

Mr. FITZGERALD. Yes. If you evacuate the entire population, you end up with 1 million people in the open fields surrounding Milwaukee. If this happens to be a winter day, they will get pneumonia or starve.

Mr. HOLIFIELD. If you evacuate them out of Los Angeles into the desert we don't know what will happen to them.

Mr. FITZGERALD. You need something to put them in. If they are shelters like this, which are cheaper than anything you can put up, why not add to the cost of this $43 per person for fallout protection and spend $62 to be able to survive within a couple of miles from ground zero? For a small additional cost you don't have to evacuate them out to the desert, and you can get by with 20 minutes to an hour and a half of warning time.

Mr. FASCELL. Have any studies been made of the cost that will be required to keep these shelters properly stocked for instant use?

Mr. FITZGERALD. We have some figures. They are not too well fixed. They were included as a percentage of the total cost.

I honestly couldn't say how much they want to give. If you want to satisfy yourself with the K-rations, and that sort of thing, that is one thing. If the soldiers in the field could get by with K-rations for a few days, I think people could then here. I think they might. I don't think this would be much of an additional cost per person. You people of the committee know this far better than I do.

Mr. FASCELL. But on overall costs then it certainly is a significant item.

Mr. FITZGERALD. I don't think so. If I am talking $62 per person a shelter I can't imagine $62 worth of K-rations in 3 days. Probably something like 60 cents worth is all a person can take. You are not moving around and not exercising.

Something in the order of $1.50 a person could permit them to survive for 3 days.

Mr. HOLIFIELD. I was in the hospital for a few days and they put me on a thousand calories a day and I guarantee you it would be very cheap.

Mr. FITZGERALD. They charged a little more for it.

Mr. HOLIFIELD. It amounted to about 3 eggs a day and 2 spoonfuls of carrots on that, and cauliflower, 1 piece of bread, and no butter.

Mr. FITZGERALD. This is a luxury. As long as we have water and toilet facilities and hardtack, we will survive. Nobody will starve to death.

Mr. FASCELL. What does toilet facilities include?

Mr. FITZGERALD. Namely a board with a series of holes in it, such as you had in the services and a trough and drain out into a septic tank.

Mr. FASCELL. You say you assume, in other words it is not included in this?

Mr. FITZGERALD. I have included this as a percentage cost. The cost we had for mechanical equipment is the usual percentage used for ordinary construction.

Mr. FASCELL. Usual percentage for ordinary construction means what?

Mr. FITZGERALD. The exact percentage you mean?

Mr. FASCELL. What does it mean?

Mr. FITZGERALD. It means you as a general contractor count all the bricks and mortar——

Mr. FASCELL. Then you figure so much for plumbing?

Mr. FITZGERALD. So much percentage for mechanical and so much percentage for heating and you hope you don't lose your shirt in bidding.

Mr. FASCELL. You are not counting on standard plumbing then?

Mr. FITZGERALD. You are not, hardly.

Mr. FASCELL. Does this include bathing facilities?

Mr. FITZGERALD. I would say "no." It would include sinks where one could get water.

Mr. FASCELL. The only reason I am asking these questions is I am trying to get some idea of what's not included in this thing.

Mr. FITZGERALD. We have not designed that completely as a layout for all the plumbing facilities. We have planned on the basis of austerity. A person needs water, a little bit of food, he needs a toilet. In the submarine service we went 2 weeks without washing and it never bothered us, particularly, and I don't see why the rest of the people could not for 3 days.

Mr. FASCELL. The biggest reason is they wouldn't have an officer with a gun.

Mr. FITZGERALD. They didn't need to use a gun to keep us from washing. The mechanical equipment is about 20 out of 120, or 16 percent, which I think is the proper allowance.

I presume you could design to include what you wish. We don't have all the answers. We have done this on our own.

Mr. HOLIFIELD. What does the FCDA think of this?

Mr. FITZGERALD. They have not seen this. They asked us for a proposal to design a test structure to be tested at Nevada in one of the coming tests. They received our proposal today. It doesn't go into this. This was strictly a technical proposal as to how one would go about it.

Mr. HOLIFIELD. In other words a good hypothetical case.

Mr. FITZGERALD. I think it's more than that. Insofar as these costs are based on past experience, we have not gone completely into toilet facilities, how many you need. Sixteen percent I am sure can provide the mechanical facilities.

Mr. HOLIFIELD. You are satisfied structurally.

Mr. FITZGERALD. More than that. I am satisfied that it will operate. To be simply satisfied structurally is meaningless. We have figured out how to get the people in there. How many entrances, how long it took, how much area was necessary to provide for them if they had to keep it shut for a day or 2 before they opened it up, the ventilation, and we provided costs to take care of the human needs of the people.

Mr. HOLIFIELD. Any further questions? Could you furnish us copies of those charts and pictures; photographs of them? It wouldn't necessarily have to be in color.

Mr. FITZGERALD. I couldn't do it immediately. I can do it in a few days.

Mr. HOLIFIELD. If your company has the facilities to prepare that, you can send them to us within a week or two. We will appreciate it.

Mr. FITZGERALD. We can do that.

Mr. HOLIFIELD. Thank you for your testimony. We would like to stay longer but several of us have appointments which are now overdue. Thank you very much.

The meeting is adjourned.

(Whereupon at 12:50 p. m. the hearing was adjourned.)

CIVIL DEFENSE FOR NATIONAL SURVIVAL

THURSDAY, MARCH 29, 1956

HOUSE OF REPRESENTATIVES,
SUBCOMMITTEE ON MILITARY OPERATIONS
OF THE COMMITTEE ON GOVERNMENT OPERATIONS,
Washington, D. C.

The subcommittee met, pursuant to adjournment, at 10 a. m., in room 1501, New House Office Building, Representative Chet Holifield (chairman) presiding.

Present: Representatives Holifield (presiding), Garmatz, Kilgore, Riehlman, and Lipscomb.

Also present: Michael Balwan, staff director, Herbert Roback, director of investigations, and Robert R. McElroy, of the subcommittee staff, and Carey Brewer, Library of Congress.

Mr. HOLIFIELD. The Subcommittee on Military Operations will be in order.

Our first witness this morning, Mr. M. D. Kirkpatrick, Chief of the Protective Construction Branch of the Office of Chief of Engineers, United States Army. Mr. Kirkpatrick, I understand, will testify on engineering considerations for protective shelter design and the work of the Army in the shelter area.

Mr. Kirkpatrick, will you please take the witness stand?

STATEMENT OF MARTIN D. KIRKPATRICK, CHIEF OF PROTECTIVE CONSTRUCTION BRANCH, ENGINEERING DIVISION OF MILITARY CONSTRUCTION, OFFICE OF CHIEF OF ENGINEERS, UNITED STATES ARMY

Mr. KIRKPATRICK. As has been stated, I am of the Office of Chief of Engineers, Chief of the Protective Construction Branch in Engineering, Division of Military Construction.

This Branch is responsible for developing engineering data and design criteria and furnishing technical guidance to our field offices as required to carry out one of the missions assigned to the Corps of Engineers under Army Regulation 10–260, and I quote:

*** * * establishing for the Department of the Army and such other elements of the National Military Establishment as may be designated, criteria and techniques and recommending policies pertaining to * * * protective construction.**

The corps has always had the mission of constructing military works which, in many instances, were required to provide protection against enemy attack.

Our branch, during World War II, was concerned with seacoast defense installations which were required to resist direct hits of large-caliber naval guns and high-explosive bombs.

Many tests and investigations were conducted in this connection which produced useful data and experience applicable to the problems which faced us after World War II in providing protection against the effects of the atomic bomb.

We have participated in all nuclear test programs where structural effects tests have been permitted, both in the Pacific and at the Nevada Proving Grounds. We have conducted investigational projects, laboratory tests and engineering studies in various fields required to keep abreast of weapon development and to enable us to meet the problems of design and construction to resist the blast, radiation and other effects resulting from the detonation of nuclear weapons as well as the fallout, contamination, decontamination and recovery problems which follow.

We have accomplished, at the specific request of the Federal Civil Defense Administration (and its predecessor, the Office of Civilian Defense of the National Security Resources Board) several contract investigations in this field.

These were funded by FCDA and our assistance was requested through the Department of Defense and approved by higher authority with the understanding that such assistance would not interfere with our normal military mission.

Mr. BALWAN. Could you tell us what these projects were concerned with?

Mr. KIRKPATRICK. That is coming next.

The first formal assistance of this nature was initiated during 1950 when the National Security Resources Board approached the Office of the Chief of Engineers with a view toward having a study of shelters and shelter designs accomplished under the technical guidance of the Chief of Engineers.

This was done through a contract with Lehigh University and a number of shelter design and studies were developed under this contract which were later utilized in various FCDA publications on subject of shelters.

Mr. BALWAN. I don't think you discuss the substance of your studies here. Is that all you are going to mention—all you did for FCDA?

Mr. KIRKPATRICK. I will cover anything you wish to ask about. I have not put any details in the formal introduction, sir.

Mr. BALWAN. Could you discuss that with the committee? Your statement is very brief.

Mr. HOLIFIELD. I suggest that as long as the statement is only a few more paragraphs, we go ahead and finish your formal introduction and then we will come back and take it up in detail.

Mr. KIRKPATRICK. In 1951, as a part of planning for the civil defense (Operation Doorstep) portions of the atomic tests held at the Nevada Proving Grounds in the spring of 1953, the FCDA requested the corps to accomplish the preparation of a test program to include an array of various framed buildings, shelters and other structures of interest to FCDA. This was handled by an A–E contract between this office and the firm of Ammann & Whitney, New York.

In June 1952 the FCDA again requested the assistance of the Office of the Chief of Engineers in the preparation of a manual on blast-resistant building design. A contract was negotiated (also using

funds provided by FCDA) with Lehigh University to accomplish certain studies and prepare data for various proposed chapters for such a manual. This work was completed in June 1954.

Informal liaison has been maintained between our office and the FCDA on matters of mutual interest involving structural design, protective features, shelters and the like, although, as General Sturgis, Chief of Engineers, has stated in his testimony before the committee on March 8, 1956—

> the Corps of Engineers has not had the responsibility for estimating requirements for shelter protection for the civil-defense program.

I would like to add that our activities have been oriented primarily toward meeting the requirements of principal interest to the Army and the military. I mean by that the protection of vital operations, and the protection of vital operating personnel on duty as opposed to any general overall shelter program for military personnel.

That orientation involves a somewhat different type of requirement than the civil-defense interests are concerned with, in that we are generally faced with meeting specific requirements for more or less individual structures, sometimes in isolated locations and maintaining operations in those structures rather than just using them as shelters.

Mr. HOLIFIELD. Give us some examples of that.

Mr. KIRKPATRICK. An example would be a command post, where certain control functions must be carried on without interruption perhaps at the time of bombing attack or when radioactive fallout is occurring or when clinical or biological attack is being used. You cannot crowd people into a structure like that on the basis of a minimum occupancy per person. You must insure continuity of essential utilities, like power, water supply, ventilation, air conditioning, and so on. In most cases you cannot allow, and may not be possible for people to emerge or leave these structures during periods of extensive fallout or high levels of contamination and it may also be required to provide facilities for decontamination of people who are required to come through a contaminated area into the structure during the time it is buttoned up.

Mr. HOLIFIELD. You would include in that category military structures, possible air domes, munition storage plants, nuclear assembly plants, different things of that type.

Mr. KIRKPATRICK. Yes, sir. Any type of facility which the Army would consider vital and for which perhaps there might be no possibility of duplication, dispersion, or alternate operation such that it would not be necessary to go to special protection for it.

Mr. HOLIFIELD. It would involve very heavy construction and very expensive construction as a rule and would not be the type of construction that could be used from an economic standpoint by civilian population.

Mr. KIRKPATRICK. No, it is not always expensive. It need not always be very heavy, because in some instances its protection can be considered in terms of its proximity or distance from primary targets. We still follow a policy of attempting to disperse where possible rather than putting something right in the area where it is almost certain to get——

Mr. HOLIFIELD. Your munition storage places—I have been in many of them—they are of very heavy construction. Your alternate Penta-

gon is of very, very heavy construction and other structures that I have been in are of heavy construction which would not be at all practical from an economic standpoint for the civilian population. The point I am bringing up is that the type of work you have been doing for the Army is not the type that lends itself to mass shelter for civilians, does it?

Mr. KIRKPATRICK. The technical data developed as a result of our investigations would be applicable to any shelter or protected structure. However, we have not oriented our efforts toward the type of mass protective shelter or shelter program which appears to be of particular interest to this committee.

Mr. HOLIFIELD. All right. Will you then, as Mr. Balwan started to question you, tell us what the specific requests were and elaborate a little bit on the specific requests of the FCDA which you mentioned here?

Mr. KIRKPATRICK. Yes, sir.

With your permission, I would like to describe a little further some of our past activities within the Corps of Engineers which prompted some of the assistance that was requested by FCDA. I have stated during World War II we were concerned with protection against bombs and conventional weapons. There is not a great deal of difference between strength of structures to resist direct hits of weapons and also to resist high blast loads. In fact, it may require a stronger structure to resist a direct hit of a large bomb or artillery shell than it does to resist the blast load of atomic weapons.

As a result of the work we had done during World War II, we initiated a number of investigations at the end of World War II which we felt were necessary to obtain the additional data that were required to meet the differences in effects of atomic weapons as compared to those of penetration and resistance to direct hits incident to conventional bombs. About 10 years ago (in 1946) we undertook a study of underground installations. The use of existing mines, the feasibility of using existing mines for vital industrial facilities or for storage purposes or for operational purposes.

Along with that study came the conclusion that it might be necessary to go to areas where there were no existing mines or excavations so these studies also covered investigation of potential underground sites where it might be possible to create an excavation to accommodate the facility.

We initiated a rather comprehensive test program covering underground explosion effects scaled from 320 to 320,000 pounds of TNT which was conducted in Utah and Colorado during the period 1947 through 1952. We initiated several investigations and laboratory test programs at universities and institutions, which were oriented toward developing data which we thought were necessary to carry out our responsibilities in the field of protective design and construction.

It was logical that the Civil Defense Administration should approach us with the idea of getting such help as we could furnish them on these subjects because at that time I believe the military agencies were the only ones which had access to certain classes of data or had participated in nuclear test programs and when we undertook this shelter study for them with Lehigh University, it was partly because of that experience.

The contract with Lehigh involved a study of British shelters during World War II and the development of various types and methods, and designs of shelter structures for backyards, for family purposes, for reinforcing basements of homes to provide shelters. As I remember, there were two types of what would be referred to as communal types of shelters, where 50 or 100 people would be sheltered in one structure, rather than a very few people at their home or in the backyard. There were some cost and dispersion studies of shelter programs made as a part of that contract.

That data of course were turned over to civil defense and I believe a good many of the designs that appear in the FCDA manuals which were referred to yesterday resulted from those studies.

Another field which we were interested in at about this same time and which I think should be a little further described here is our participation in what was referred to yesterday as the Greenhouse program of atomic tests in the Pacific in 1951.

Mr. Cohen, who testified yesterday, represents the firm of Amrmann & Whitney which we engaged in 1949 to undertake the design of the test structures which we proposed to build and test during the program as a part of the Army portion of a military structures effects test.

Our proposed design was very unusual at that time in that we felt a structure could be designed to resist the dynamic loading of the atomic blast pressure which occurs over a very short period of time, a matter of less than a second in that case, and that if it could be determined how the structural elements behaved during this relatively short period of time, for comparison with predictions it might be possible to work out design procedure which would be applicable to a wide range of structures other than the ones we were testing.

It is very costly to test every type of structure in which one might be interested. It would require years and years and one would probably never know for sure how to apply the results to a structure which you had not already tested. So the Corps of Engineers portion of that test program was oriented not just to finding out whether a structure would stand or fall down but how various elements that make up a building or a surface structure would behave, so that the knowledge could be applied to other designs and for other shapes and configurations of buildings.

In that respect we felt we were very successful in that when we checked back after we had the measured results we were able to confirm the design based upon the dynamic analysis. We hoped that by measuring at literally thousandth increments of a second during the time the pressure was working on the test structure what it was doing and how far it was deflecting or displacing, we can from that type of information develop a design procedure which could be applicable to many other structures.

That was accomplished by this program and we are now in the process of putting the information in manual or useful form for military construction purposes. I say military because we have no authority to write manuals for dissemination of such information to the general public.

During the time that Ammann & Whitney were designing this test structure for us the Civilian Defense Office of the National Security Resources Board approached us again with respect to getting assistance on a manual that they were considering.

That manual later was published after the Federal Civil Defense Administration came into being, as an FCDA document. That has been referred to. It is the one on windowless structures, TM S–4. They obtained assistance from Ammann & Whitney in preparation of that manual and after review for security it was released and published as an unclassified document.

Mr. BALWAN. As a classified document.

Mr. KIRKPATRICK. Unclassified document.

Mr. BALWAN. When was that released?

Mr. KIRKPATRICK. I think it was dated 1952. I don't happen to have that with me. But I think that was presented yesterday in the record.

Mr. BALWAN. Do you know of any building that has been built according to those specifications?

Mr. KIRKPATRICK. I don't know one that has been built following all of the details in that manual, sir. We furnished guidance to an architect engineer firm for the design of a structure which could probably be said to follow as closely to that as any structure I know of in the military. That is the building at Walter Reed Hospital known as the Armed Forces Institute of Pathology, which is definitely a windowless structure. It was designed to resist pressures as tabulated in the front of that particular manual for various zones which again were based upon an estimated yield of weapon and distance. The manual, however, was not actually available at the time the architect engineer firm designed the building so we had to give them what we would call short-cut methods to apply which we felt would produce essentially what would be required to meet those requirements.

Mr. HOLIFIELD. Do you know what the cost per square foot of that building finally was?

Mr. KIRKPATRICK. The cost per square foot, as I understand, is of the order of $28 per square foot.

Mr. HOLIFIELD. How thick are the walls?

Mr. KIRKPATRICK. The walls would generally run around 12 inches of reinforced concrete.

Mr. HOLIFIELD. And the roof?

Mr. KIRKPATRICK. I believe the roof is 12 and 15 inches. Some places it is probably 15 inches instead of 12.

I would like to interpose here on cost estimates or costs per square foot, that they are very difficult to apply unless one considers what is included and what type of structure we are considering and for what type of building. For structures $28 per square foot would possibly appear to be a rather high cost.

We have to comply with statutory limitations, as you probably know, for warehouses of $6 per square foot, for barracks of the order of $10 per square foot. This structure, had it not been blast resistant, would probably have cost upward of $20 per square foot, depending upon what the design would have been if it had not been made blast resistant.

Mr. BALWAN. What loading was it designed for?

Mr. KIRKPATRICK. The actual loading—this has been published—was an equivalent static loading on the walls of the order of 6.8 pounds per square inch. That was not the actual load which the engineer used to design elements for the structure. Without getting into a technical discussion as to how these loads are applied, I think it might be more

appropriate to express it this way, that the structure was oriented so that it was most favorably presented to an anticipated bomb over the downtown area of the Capital, which means that the long dimension was in the same direction as the shock wave would hit the building had it occurred.

The wall facing the shock wave, the wall of the building facing a shock wave is subjected to a much greater load and was designed somewhat stronger than the side walls or the roof of the structure, which do not get the direct impact of the load.

Mr. ROBACK. What was your radius in figuring that p. s. i.?

Mr. KIRKPATRICK. Based upon the tabulation in that manual I believe it was based upon a zone—I am not sure whether I can state the size of the weapon and the distance in this case without getting into classified matter.

It was based upon a distance from a bomb over the zero milestone, which I can say was not in the megaton range.

Mr. ROBACK. Not in the megaton range?

Mr. KIRKPATRICK. Not in the megaton range.

Mr. ROBACK. So what is the actual distance of the structure from the Capitol?

Mr. KIRKPATRICK. About five and a half miles or of that order.

Mr. ROBACK. So that the planning assumption, so to speak, in this thing was that you would not have a bomb in the metagon range. You would assume an enemy strike would be of a smaller type of a weapon.

Mr. KIRKPATRICK. I would like to amplify this statement. There was another structure located at the Soldiers' Home Hospital, an addition to the Soldiers' Home Hospital, which was in the same program with this structure at Walter Reed.

It being a hospital type of structure, it is very much different than the structure at Walter Reed. That was more of a laboratory type of building than a hospital, with wards and that type of thing. Both of these structures were in the budget at the same time and the requirement that both of these structures be made blast resistant to existing standards which then were to come from the National Security Resources Board did not make any distinction as to the actual distance for either structure.

The Soldiers' Home Hospital happens to be 3½ miles and I believe the Walter Reed Hospital 5½ or that order. The standards were selected on the basis of the closest of the two structures and actually were used for both.

So it happens that the designs being roughly for the same overpressure, the Walter Reed Hospital job would be good for a larger bomb than the one at Soldiers' Home if it occurred over the zero milestone. Then we get into the difficulty of whether this bomb will be there or how much they might miss.

Mr. ROBACK. Let's assume it will be dropped where you figure. If you're providing for 6 or 7 pounds per square inch resistant pressure, if the bomb were in a 40-metagon range you would have to locate the structure maybe 15 or 20 miles away.

Mr. KIRKPATRICK. I don't believe those figures are right. But I can't go into the actual distances and size of the bomb.

Mr. ROBACK. We are not asking for actual distances, we are asking for order of magnitude.

Mr. HOLIFIELD. We have our own charts which have been checked with independent nonclassified sources in regard to pressures and we have an estimate that a 10-megaton bomb would exert a pressure of 20 p. s. i. at a distance of 4 miles.

A 10-megaton bomb, 20 p. s. i., which would be about 3 times what you figure you could do, you could stand out there in about the same distance.

Mr. KIRKPATRICK. I am not in a position to say whether or not those figures——

Mr. HOLIFIELD. It also shows that a 10-metagon bomb would exert about a 5 p. s. i. at a distance of about 9 miles. It would indicate that your structure out there would not be safe under the pressure of a 10-megaton bomb if it were exploded over the center of Washington, D. C.

Mr. BALWAN. How far is Walter Reed, did you say?

Mr. KIRKPATRICK. Five and a half miles. I think you will find that the pressures do not fall off on a straight line basis.

Mr. HOLIFIELD. That is right.

Mr. KIRKPATRICK. As you go away from ground zero the pressures drop very rapidly. As you get further away from ground zero they do not drop so rapidly but extend out at greater ranges. This structure and size weapons you are talking about is probably in this critical area where the pressures are beginning to drop rapidly. Also based—again I hate to get into technical discussions of the design procedures used and what resulted from that design, but as I said before we had to furnish equivalent static loads for the stated overpressure, we had to give design loads for the engineer to use for the elements of this structure. In this case the south wall of the building was designed for about 27 pounds per square inch, equivalent static load, not 6 pounds per square inch.

The sidewalls of the building were designed for about 13 pounds per square inch or without a reflected loading and the roof also. All the walls and the roof were designed not only for the positive load tending to push the walls in but a negative load having the effect of pulling the walls away from the structure.

Since equivalent static design methods were used, the behavior of the structural elements is still within what we refer to as elastic limits, that is, after a load applied in that magnitude the structure would not have evidenced any failure or permanent distortion or depletion after the load is removed.

One of the things we have learned in this dynamic analysis is that you can subject elements to larger loads than would normally be considered as a safe static load without violating normal safety practices which you would have to comply with if you were designing a structure for continued occupancy under those loads.

Another factor is it would not be necessary if you were only interested in protecting the personnel or operations of the building that after the blast the building remain unaffected.

There could be deflections, cracks, and considerable distortion of members or elements of the structure without being dangerous to occupants or affecting the occupation or the usefulness of the building.

In that respect we feel—again this is because it was not designed in accordance with the way we would now go about a dynamic design

of the building—that it would probably actually survive a greater pressure than 6.7 pounds per square inch overpressure and just in round figures I would say it would be in the order of 10 pounds per square inch if it could be based upon a determination of how much deflection, displacement, and distortion or other effects on the building could be accepted.

That is an element in which there is always a range of judgment as to what might be acceptable.

Mr. ROBACK. It still would not take you into the megaton explosion. The data, I think, were based on so-called nominal bomb explosion effects, the type of bomb that was used in Japan?

Mr. KIRKPATRICK. I personally feel if this megaton weapon was at zero milestone—again I can't get into specific discussions as to pressures and effects of these weapons at the distances without going into what is presently to my knowledge classified data—but it would stand under certain sizes of megaton weapons.

Mr. HOLIFIELD. For practical purposes $28 a square foot, of course, is the cost of a structure which is so high that even considering the fact that it might be efficient, would still be prohibitive in the field of mass shelters.

I would like to know—getting away from these military structures—you spoke of having designed something in the way of a communal shelter for the FCDA to take care of a hundred people say. Do you have any cost estimates as to what that type of structure is?

Mr. KIRKPATRICK. I do not have them with me, sir. The results of that work of course were turned over to the FCDA and whatever has been published by them in manuals would possibly have been based on that. As I remember, the communal type shelter, we will say 1 for 50 persons involved an underground structure of relatively narrow shape in order to reduce unsupported spans and I believe of 12 inches of concrete in 1 case and 15 inches of concrete in another case. The costs, again average costs, for an average city locality were, as I remember it, and I am quoting only from memory now, were in the order of several hundred dollars per person. Possibly $175 to $300 or $400, but I would like to check that.

Mr. HOLIFIELD. I wish you would check that and furnish the figures to the committee.

This brings up the testimony we had yesterday from Mr. Fitzgerald of American Machine & Foundry Co., where—were you present when he gave the testimony?

Mr. KIRKPATRICK. Yes, sir.

Mr. HOLIFIELD. From an engineering standpoint could you comment on his testimony for the benefit of the committee?

Mr. KIRKPATRICK. It is very difficult to be confronted with a study of the type that he exhibited and in a few hours make intelligent comments, criticism, or engineering analysis on something which has perhaps taken months and months to prepare.

I would like to point out that costs per square foot, or costs per person, can be greatly influenced by arrangement of structures and that the structures that were presented were certainly of a type which, to my knowledge, have never been built. It is very difficult to say with-

out some engineering study that prepared estimates of costs or capabilities of such a structure are wrong or right.

To me, based upon construction costs and types of facilities that the Corps of Engineers have had anything to do with, the costs appeared to be very low.

I think that is recognized by the committee, no doubt. Again going back to costs of shelters, if you protect 1 person in 1 shelter, the cost per person is bound to be extremely large. If you can put 100 people in 1 shelter, the costs will go down. If you can put 10,000 people in a shelter, the costs will go down still further. However, we have not in the Corps of Engineers, had occasion to go into any type of structure of that nature and cannot comment from experience on how low this cost might become or how this cost might compare with those structures which we have done, because there is no comparison.

However, I don't know of very many structures that we build of a permanent type which can be built for very much less than $4, $5, or $6 per square foot. Those are not protected structures. Those are just the bare minimum that is required to provide the facility.

Mr. HOLIFIELD. Do you have any comments to make on the engineering difficulty of a domestic-type structure without perpendicular supports expanding an area of 250 lineal feet?

Mr. KIRKPATRICK. I am not a specialist in arches and domes.

We have recognized for some time that arches and domes are more ideal; not only toward resisting blast loads but to supporting their own deadweight on long spans or even the weight of earth fill or a superimposed blast load.

The difficulties involved in getting a foundation which will hold up the arch on that span and with the total blast load and weight of earth, which is also there regardless of blast, might make it very difficult to find suitable foundations for such a structure. As I said before—an engineering study is required before one can comment intelligently on such a proposal, and I would prefer not to jump to conclusions one way or the other on it, without benefit of such a study.

Those structures which we have had any interest in of course being designed for relatively small operational units or personnel operating facilities which are considered vital are of such relatively small dimensions that cost comparisons there would not be conclusive.

We have not found very many ways of designing smaller structures for less than possibly $10, $15 per square foot, where a degree of blast resistance is involved plus all of the necessary utilities to permit operation under attack conditions. In many instances the cost would go up even above that because of the requirement for continued operations. As I said earlier, one must have in a structure which is required to be buttoned up against attack and fallout a supply of fresh air. The very minimum that we have considered for any shelter which would be occupied is 3 cubic feet per minute per person. I would prefer not even to mention that figure because 10 cubic feet would be more desirable, I mean by that 10 cubic feet of air per minute per person in the shelter. If you cannot get that amount of air in a very short time, the air will become unbreathable, carbon dioxide will build up and oxygen will be consumed.

So that it is almost essential to bring air into a structure unless you have such a tremendous volume of air that the people could have enough to supply them for an extended period of occupancy.

Our types of military protective structures generally provide an air intake system capable of bringing fresh air in during attack and filtering the air to remove contaminants; we are concerned not only with radioactive but chemical and biological agents which are also a possibility.

In bringing air into a closed structure, some method of circulation is essential, otherwise people in the structure will not get the air even though it has been provided.

That requires some source of power which in turn (if you are relying on an outside source of power, that may be gone at the time you are using the shelter) will, in many instances, necessitate emergency or standby power be provided to the extent necessary to maintain air supply and proper circulation, and infiltration.

Mr. HOLIFIELD. Of course, hand-operated devices could be provided of a comparatively simple nature.

Mr. KIRKPATRICK. For small structures; yes, sir. Not for large structures.

Mr. HOLIFIELD. No.

Mr. KIRKPATRICK. Another factor is that winter and summer conditions will vary at least in many areas; if it happens to be in the summertime and the people in the structure cannot have conditioned air, the air that comes in may add to the temperature buildup which will always occur in an occupied closed structure to the extent that it would become unbearably hot, unless they could open up and get fresh air. As was pointed out yesterday, it is not necessary to exclude air for the total length of time that the structure is occupied without filtration, because after the fallout has occurred and if there is no wind you could take the risk of pulling the air in even with a slight amount of contamination, provided that risk can be taken.

We have not been, from a military standpoint, prone to accept that possibility, because we don't know whether particles of dust that come in with the air have high radioactivity. If you get the structure that you have spent money and effort in protecting contaminated on the inside, you have not gained as much protection as might be consistent with the blast protection provided.

Another problem which enters into that type of a structure which we have found from our investigations on underground construction is that the general tendency in closed up structure is that the temperature will get warmer and removal of heat will be a major problem, not the addition of heat or overcoming a cold condition.

Removal of heat from the air usually requires some type of cooling or air conditioning system which in turn requires refrigeration or compressor equipment if the air is to be kept reasonably comfortable for extended periods of occupancy.

Mr. ROBACK. Mr. Kirkpatrick, what advantages do you understand were derived by having the FCDA contract with you to contract with another agency?

Mr. KIRKPATRICK. One probably basic reason at the time was the FCDA was not in a position to contract for themselves.

Mr. ROBACK. You mean they did not have engineering personnel who knew what they should contract for?

Mr. KIRKPATRICK. I think they had engineering personnel, but I don't think they were set up to undertake the various administrative and other functions of a contracting officer. I say I believe that is the case. I may be wrong.

The other was that we had the background of well, many years of investigations in this line and actually the engineers during the early part of World War II did accomplish much of the civil defense work for the Civil Defense Administration of World War II, and as to the availability of engineers in that organization, I don't know—I would judge that——

Mr. ROBACK. Aside from the servicing, I mean from performing the administrative services on the contract, what did the engineers do? Did they for example provide technical people to supervise the actual contract?

Mr. KIRKPATRICK. We gave technical——

Mr. ROBACK. To approve the contract?

Mr. KIRKPATRICK. We gave technical guidance to them; otherwise we would not have been willing to undertake the job or undertaken it because we are not just a contracting administrative agency.

Mr. ROBACK. Where did Lehigh University get the engineers to perform under this contract?

Mr. KIRKPATRICK. Lehigh University had previously accomplished a survey for the Ordnance Department, I believe, of the strategic bombing survey which was made in Germany after World War II, with particular objectives of obtaining information that Ordnance was interested in. So they had occasion under that contract to inquire into it, and acquire some background in the effects of bombing on structures.

Mr. ROBACK. Did they subcontract their contract to a firm of engineers?

Mr. KIRKPATRICK. No, sir. I think they possibly had one subcontract which involved the actual design of these communal shelters.

Mr. ROBACK. The actual design.

Mr. KIRKPATRICK. They went to an engineering firm outside to do the detailed work, of putting on paper, what we would consider contract drawings.

Mr. ROBACK. The sequence was for FCDA to make a contract with the Corps of Engineers to make a contract with Lehigh University to make a contract with engineers to design a shelter, which comes back through channels to FCDA.

In letting such a contract, do you give any consideration to competing firms?

I don't mean in selecting a low bid but I mean in getting several alternate designs.

Mr. KIRKPATRICK. Not normally—in fact I don't believe we are permitted to compete for engineering services or have engineering services awarded on a competitive basis or low price basis.

Mr. ROBACK. I am not talking about awarding a given contract. I am talking about making several sets of awards because you don't know quite what the firm you choose is going to come up with.

Mr. KIRKPATRICK. I am not sure I understand your question.

Mr. ROBACK. Suppose the university came up with a plan which the engineers did not consider feasible. What would have happened in that case?

Mr. KIRKPATRICK. It should not happen because we were furnishing technical guidance throughout the contract and normally such a contract involves the submission of preliminary plans and the approval of procedures and outline of work, scope of work, and so on. You just don't go into a contract without knowing what the purpose or the general extent of work is to be.

Mr. ROBACK. But you were hiring a firm to do something new. To come up with some idea that would be in a new field of which the engineers did not know all the possibilities if I understand your testimony. Certain planning assumptions had to be made.

Mr. KIRKPATRICK. You mean why didn't we do the work ourselves rather than contracting it?

Mr. ROBACK. That was not necessarily the question. The question was: Did you give any consideration to getting several alternate designs?

Mr. KIRKPATRICK. In answer to the first one, the primary purpose of this contract was not that of producing the plans for a communal type shelter. It was a study contract to investigate the whole field of shelter, what had been done in Europe during World War II, how effective those structures were, what they cost, what types were utilized, and also studies of what might be done in the United States as compared to what was done in England. Many other facets of this other than just coming up with the design of a box which would be considered a communal-type shelter and at a cost.

That was one portion of the contract. We went to Lehigh University—I don't believe I would be permitted to discuss who else was considered at that time because we felt that an organization of that type was in a better way to undertake the investigations, the research of going through documents and reports and so on than to just go to an engineering firm that is set up to prepare engineering drawings and do engineering work.

By the same token in general these universities are very reluctant to undertake work that is primarily engineering work, of the type that would normally be accomplished by professional outside engineering firms. So it is not unusual for an educational institution who may take an investigational contract to subcontract those portions which they feel could be better performed by outside firms.

Mr. ROBACK. Let me ask you this question. Suppose the FCDA did not have legal authority to contract for the performance of this kind of service but had the legal authority to call upon a Federal agency to perform it, would the engineers consider that if they let the contract instead of the FCDA that they were conforming to that legal arrangement which I just described?

Mr. KIRKPATRICK. I don't understand the question.

Mr. ROBACK. Let me restate it. Suppose the FCDA did not have the legal authority to make a contract with outside parties because some agencies are limited in their contract authority, in the performance of services, and suppose they did have the authority to contract with another Federal agency.

By getting the engineers to make the contract, do you consider that that would have been in conformity with this legal arrangement which I described, namely, that they could contract with a Federal agency but not with an outside agency.

Mr. KIRKPATRICK. I am not sure that I am qualified to answer all of those questions. As I understand it, a transfer of funds between the Federal Civil Defense Administration, being also a Government agency to another Government agency is not called a contract and under no circumstances is it ever regarded as a contract commitment. Funds are not committed in that manner the same as if they were awarded as a contract. Between civil defense and us it was a transfer of funds and from then on it was the same, it would be the same as if they were our funds budgeted for expenditure by the engineers in the same way that we would spend other funds and we have to comply of course with any restrictions or limitations which are imposed on our own activities had they been actually military construction funds, which are the type that we are authorized to spend.

Mr. HOLIFIELD. One question, I would like to ask in the latter part of your statement, you said, "In June 1952 the FCDA again requested the assistance of the Office of the Chief of Engineers in the preparation of a manual on blast-resistant building design" and that was finished in 1954. That was the contract Mr. Roback referred to with Lehigh University. Do you consider that manual that was completed in 1954 to be a valuable contribution to the field of blast-resistant structures?

Mr. KIRKPATRICK. That was the second contract with Lehigh University, sir.

Mr. HOLIFIELD. Yes.

Mr. KIRKPATRICK. I stated, I believe, that the work covered by that contract was to accomplish certain studies and prepare data for various proposed chapters for such a manual. It was not actually to write a manual which would be printed as delivered we will say from Lehigh to us or to FCDA.

Mr. HOLIFIELD. To prepare technical material to be used in a manual.

Mr. KIRKPATRICK. Yes, sir.

Mr. HOLIFIELD. Do you consider that technical manual to be of current value in the formulating of a manual to build blast-resistant structures?

Mr. KIRKPATRICK. Yes, sir; I do. In fact we are pursuing further on our own from the military standpoint some of the types of studies that were actually done by Lehigh under that contract.

Mr. HOLIFIELD. Do you know how much was spent on that contract?

Mr. KIRKPATRICK. I believe the amount was of the order of $50,000.

Mr. HOLIFIELD. Does the material have application to individual shelters and communal shelters?

Mr. KIRKPATRICK. It would have application to almost any type of structure which would be required to be designed as a blast-resistant structure.

Mr. HOLIFIELD. Was there any scale of costs also prepared?

Mr. KIRKPATRICK. As one portion of that contract there was a comparative cost study of hardening an unprotected conventional structure, one which had actually been built to obtain several degrees of, several successively higher degrees of blast resistance or, expressed

another way, to determine how much closer such a structure could be place to ground zero of a—I think in this case—the nominal bomb because that data was unclassified, to determine what reduction in damage distances might be obtained by spending successively larger increments of cost and what might be obtained in the way of benefits in the way of additional protection corresponding to those additional costs.

Mr. HOLIFIELD. What was the range of those costs per square foot?

Mr. KIRKPATRICK. As I remember on that work it was not expressed so much in a square foot as it was on a percentage increase of cost. Well, for perhaps 5 percent increase in the cost of the structure, you could obtain a closer distance to ground zero of the weapon on the pressure time scale of possibly a mile or a mile and a half. Of course incorporated in that were curves and data that I can't remember.

Mr. HOLIFIELD. Cost distance curves type of thing?

Mr. KIRKPATRICK. Yes, sir. I say that appeared to us to be a rather valuable way of arriving at the economics of protected structures. This was a surface structure, not a shelter. It was a building which would represent an investment on the part of an owner or builder of a structure, and we have undertaken certain studies of our own for military-type structures of specific types to determine what ranges of cost increase might be involved to obtain closer and closer distances to atomic blast. The work has not been completed and I am reluctant to indicate any firm figures, but in general the trend is something like this: Considering megaton weapons where we all know very low overpressures, in the order of 1 or 2 pounds per square inch will extend out many, many miles from ground zero and such overpressures are sufficient to blow windows out of structures and to disturb partitions and to certainly dislodge and move furniture and perhaps cause injury to personnel who happen to be in a structure at the time that load is received. By hardening, and I am speaking now of military structures, leaving out the windows, making the walls of a type of construction which can be designed to provide a higher blast resistance than the average type of building wall, we have found that for perhaps a 10-percent increase you can again gain a distance of many miles in coming in closer to ground zero. Where a structure might be vulnerable at as much as 20 miles in terms of this 1- or 2-pound overpressure that by spending possibly 10 percent more on the structure and changing it to the extent of making them windowless and incorporating any engineering and design features which would contribute to their resistance, it could be moved into perhaps as close as 6, 7, 8, 10 miles instead of 25 miles.

Mr. BALWAN. How much pressure do you buy for 10 percent more, roughly?

Mr. KIRKPATRICK. If you were interested in a pressure of say 10 pounds per square inch which was of the order of the structure when we were discussing it at Walter Reed Hospital, you could possibly get that protection for a cost increase of 15 to 20 percent of—and I would like to emphasize this—of the structural cost of the building.

Again I want to emphasize that cost figures are very misleading unless you know what they are applied to.

Some buildings which we strengthen to resist blast have a lot of features the cost of which will not be changed one bit by adding blast

resistance over the cost of these same features in a conventional structure. It is not fair to compare cost increases for protection only on the basis of an overall cost of a structure. For example a building like the one out at Walter Reed which cost $28 per square foot might have been built unprotected for $24 per square foot—again I am picking this figure as approximate because we did not make a conventional design on which to have such an estimate. We have spent $4 per square foot or about 15 percent of the total cost to get hardening for that building. If we took a warehouse where we are limited to about $6 per square foot and added $4 per square foot to that building it would be almost doubling the cost of that structure because it is almost entirely structural. Expressed another way, 15 percent on the cost of a $6 per square foot warehouse would only allow about 90 cents per square foot for protection, as compared to $4 for the more costly building.

The other building (Armed Forces Institute of Pathology) has a lot of costs which are not structural. So percentagewise you must know what type or range or quality of building you are discussing. Further, if you leave out windows in a structure which normally has no ventilation, you must add a ventilation system to the building, which involves perhaps an added cost. It may make the building more comfortable from an occupancy standpoint because a ventilated building is certainly better than one having no ventilation.

If you go to the point of adding air conditioning, which is a higher level than just ventilation, you will add more cost to the building although you will actually be getting a structure which is of a higher quality than what you started out with, so that factor must be borne in mind, when we are talking of conventional-type buildings and relative costs and percentages.

Mr. HOLIFIELD. Mr. Kirkpatrick, I think when we are getting into that field we are getting far afield from a practical possibility for either a home shelter or a small communal-type shelter and I don't envisage that type being practical from an economic standpoint right at this time.

Could I bring you back to the type of study that FCDA asked you to make and ask you if all of that study was pointed toward aboveground structures or did it include below-ground structures?

Mr. KIRKPATRICK. It covered both types, sir. It included what we would refer to as buried or semiburied structures as well as aboveground buildings.

Mr. HOLIFIELD. That is in the Lehigh University study?

Mr. KIRKPATRICK. Yes, sir.

Mr. HOLIFIELD. I suppose that also has charts of comparative costs or estimates of costs.

Mr. KIRKPATRICK. The reports that were submitted of course had charts and I am not qualified to say what distribution has been made of those either as they were prepared or whether they were consolidated or how they were consolidated in civil-defense publications.

Mr. HOLIFIELD. We can get to that as long as we know they are there; we can get to that when the FCDA comes before us and we can explore that angle.

Are there any additional questions of Mr. Kirkpatrick at this time?

If not, we thank you very much, sir, for your testimony this morning.

We will excuse you and call Mr. John P. Chapman, the director of defense planning staff for the Housing and Home Finance Agency to the witness stand.

Mr. Chapman, you have a prepared statement?

Would you like to present it at this time?

Mr. CHAPMAN. Yes; I would like to say at this point I have accompanying me two people; Mr. Jarchow, the Director of the Appraisal and Mortgage Risk Division of the Federal Housing Administration; and Mr. Randall, who is Project Engineer on the staff of the Urban Renewal Administration.

They do not have prepared statements, but they are here to assist me in any way. I am not an engineer of any sort.

Mr. HOLIFIELD. We are glad to have them with us.

STATEMENT OF JOHN P. CHAPMAN, DIRECTOR, DEFENSE PLANNING STAFF, DIVISION OF PLANS AND PROGRAMS, OFFICE OF THE ADMINISTRATOR, HOUSING AND HOME FINANCE AGENCY; ACCOMPANIED BY ALFRED W. JARCHOW, DIRECTOR, APPRAISAL AND MORTGAGE RISK DIVISION, FEDERAL HOUSING ADMINISTRATION, AND PHILIP A. RANDALL, PROJECT ENGINEER, URBAN RENEWAL ADMINISTRATION

Mr. CHAPMAN. Mr. Chairman and members of the committee, I am pleased to have this opportunity to appear before this committee to discuss the civil-defense activities of the Housing and Home Finance Agency.

Under a delegation of authority from the Federal Civil Defense Administrator contained in FCDA delegation No. 2, approved by the President on September 8, 1954, the Housing and Home Finance Agency has the responsibility for the following three broad areas of civil-defense activities:

(1) Conducting research and providing technical guidance to the States concerning protective standards for new housing construction and temporary shelter in existing housing facilities;

(2) Planning a national program, providing technical guidance to the States, and directing Federal activities concerned with the provision of temporary emergency housing in support of areas subjected to enemy attack; (and this is a typographical change) "subject" to "subjected."

(3) Planning a national program, developing technical guidance for States, and directing Federal activities concerned with the emergency restoration of essential housing and those related community facilities damaged by enemy action for which the agency normally has legal responsibility.

We are also responsible under the delegation for dovetailing similar and parallel responsibilities that have been assigned to us by the Office of Defense Mobilization.

Shortly after the receipt of the delegation from the Federal Civil Defense Administrator it became clear to the Housing Administrator that the scope and urgency of the Housing Agency's role in civil defense required the full-time attention of a special staff.

For that reason there has been established within the Division of Plans and Programs of the Office of the Administrator a defense planning staff.

To assure that maximum use is made of the extensive technical know-how possessed by personnel throughout our agency and that our activities are carried out in a coordinated manner, the Administrator also established the Housing and Home Finance Agency Defense Council, an advisory body, with the director of the defense planning staff as chairman, and composed of a representative from each of our constituent agencies and units—the Federal Housing Administration, the Public Housing Administration, the Federal National Mortgage Association, the Community Facilities Administration, and the Urban Renewal Administration.

Both the Defense Council and the defense planning staff are concerned not only with civil defense activities but also with related defense mobilization functions.

Our delegation from the Federal Civil Defense Administrator was received during fiscal year 1955.

However it was not until fiscal year 1956 that the Federal Civil Defense Administrator was in a position to make an initial allocation of funds to support our work under the delegation. Of the total amount of $1,500,000 that was appropriated for the current fiscal year for the work of all delegate agencies, the sum of $25,000 was made available to the Housing Agency. In advising us of this allocation last August the Federal Civil Defense Administrator described it as a token amount but one which should enable us to plan a more active program for 1957.

Before describing our 1957 program—and speaking quite frankly, practically all of our work under the delegation lies ahead of us and over an indefinite period of time—I shall review briefly our accomplishments to date.

The Agency has cooperated with the Federal Civil Defense Administration and the Atomic Energy Commission in the atomic tests of dwelling structures held last spring.

Agency staff members were assigned to work with the Atomic Energy Commission's civil effects test group. Mr. Philip A. Randall, who is with me today, of the Urban Renewal Administration, served as project officer for the dwelling project working under the direction of Mr. Benjamin C. Taylor of the Federal Civil Defense Administration.

In this work Mr. Randall was assisted by Mr. William Russell of the Federal Housing Administration.

The objectives of these tests were to develop data on the behavior of a variety of residences exposed to nuclear effects—primarily blast.

Two each of five types of dwellings were exposed to the effects of an atomic bomb of approximately 30-kiloton yield detonated atop a 500-foot steel tower. The types of dwellings and their distances from the explosion were as follows:

Two-story and basement brick-and-cinder block, 4,700 feet and 10,500 feet;

One-story frame rambler with concrete bathroom, 4,700 feet and 10,500 feet;

One-story reinforced precast lightweight concrete panel, 4,700 feet and 10,500 feet;

One-story reinforced lightweight concrete block with reinforced precast lightweight panel roof, 4,700 feet and 10,500 feet; and

Two-story basement-strengthened frame, 5,500 feet and 7,800 feet.

Through an analysis of the behavior of these residences it is hoped that it will be possible to develop the best steps to be taken for the protection of families living in such residences, to develop—within the limits of practical economy—methods for strengthening such houses, and to gather information on the possible emergency use of such houses through emergency shoring and other repairs.

The preliminary findings of these tests were reported by Mr. Randall in an atomic energy publication. The more complete analysis of the blast effects data and conclusions and recommendations will be incorporated in a final report which Mr. Randall is now preparing.

Necessarily, most of the work we have accomplished to date under the delegation has been directed toward the identification of our program goals and an appraisal of the administrative machinery necessary to accomplish these goals. Through our representation on the Civil Defense Coordinating Board, and on various ODM working committees and groups, through frequent consultation with the Federal Civil Defense Administration staff and the civil defense representatives of other agencies, and through continuous intra-agency study of our civil defense and defense mobilization mission we have gained the experience and knowledge that will be invaluable to us in our future work.

Now as to our future program objectives. The FCDA budget for delegate agencies, which is now before the Congress, requests funds to support the work we believe should be undertaken under our delegated responsibilities during fiscal year 1957. As we see it this work would fall in the following program areas:

1. Development of protective standards for new housing: Considerable technical research by Government and industry has already been undertaken in the area of protective standards. However, a great deal remains to be done in terms of pulling together the conclusions derived from these studies so that they can be related to programs administered by the agency. The emphasis will be in initiating studies to determine the feasibility—from a cost and public acceptance point of view—of incorporating protective features in the design of residential units.

The results of these studies, as they are completed, will be made available to local government, industry, building code specialists and the other public and private groups. We shall of course consider the feasibility of modifying standards governing existing agency programs as well as the need for legislative authority to promulgate such standards.

2. Development of standards for construction of shelter in existing housing: As rapidly as available technical data can be compiled and analyzed and necessary additional investigations undertaken, information as to the most practicable and economical means of providing acceptable blast and fallout shelter will be assembled for distribution to the industry and the public.

Work will also be initiated to study the merits of home versus neighbodhood-type shelters. We shall consider the steps which the agency might appropriately take in connection with existing pro-

grams to provide incentives for homeowners to construct adequate shelter.

3. Determination of emergency housing and community facilities needs and resources: Here the agency's objective is to provide local public organizations with the capability of maintaining reliable current inventories of their housing and community facilities supply and capacity measured in terms of the needs of target cities and the resources of support areas. A part of the work in this field will be to render technical assistance to cities undertaking federally assisted evacuation studies and to the Federal Civil Defense Administration in reviewing these studies as they progress.

4. Development of programs for the provision of temporary housing and the restoration of damaged housing: The agency proposes to develop standards and other technical guides for use by localities to assure maximum utilization of the existing housing supply, in a civil-defense emergency, and the ready availability and convertibility of nondwelling structures to lodge evacuees.

It is also contemplated that work will be initiated in the following areas: Technical guidance to industry groups in developing plans for large-scale manufacture of trailers, prefabricated and demountable housing meeting basic shelter requirements; and technical guidance to State and local civil-defense organizations in making rapid assessments of the feasibility of restoring housing in damage zones.

5. Development of programs for the provision of emergency community facilities and the restoration of damaged facilities: Our aim here will be to provide technical assistance to States and localities in developing plans to identify existing community facilities resources in support areas by types and emergency capacities related to anticipated evacuee load.

Among the other areas of work in this field will be those concerned with assisting State and local civil-defense organizations in developing methods for assessing the feasibility of restoring damaged facilities; and providing them with material for use in the training of the semiskilled or unskilled in performing restoration work.

In conclusion I should like to emphasize that the nature and scope of our future work under the delegation are dependent upon the action of Congress on the FCDA budget request and upon FCDA's approval of the specific projects and programs we propose to undertake.

As stated in the general provisions of our delegation the Federal Civil Defense Administrator retains the responsibility for providing the basic assumptions, criteria and standards relating to the responsibilities he has delegated to us and for reviewing and coordinating the carrying out of these responsibilities.

This concludes my prepared statement.

I shall be glad to answer any questions you may have concerning our civil-defense assignment.

Mr. HOLIFIELD. Thank you, Mr. Chapman.

As I understand your testimony, you have given us 3 delegations, 3 paragraphs here representing the delegation of functions and responsibility from the FCDA to your agency.

Mr. CHAPMAN. Yes, sir.

Mr. HOLIFIELD. Up-to-date you have been given the sum of $25,000 to pay for such work as you do.

Mr. CHAPMAN. Yes, sir.

Mr. HOLIFIELD. How many personnel have you been able to assign to this work?

Mr. CHAPMAN. The defense planning staff at this time consists of myself, one assistant, and a secretary.

That is the total staff that has been assigned to the defense planning staff.

Mr. HOLIFIELD. What is your total salary allowance of that group?

Mr. CHAPMAN. I checked with our budget officer yesterday before I came up here and I will be glad to furnish for the record the actual breakdown but as I recall he told me in terms of salary and travel and as far as my own group is concerned that it is right around $21,000 or $22,000 as of the present time. If you want me to I will provide something for the record.

Mr. HOLIFIELD. Please do provide that.

Will you give us again who the staff is—it is yourself——

Mr. CHAPMAN. And my associate, Mr. Yarger.

Mr. HOLIFIELD. And who else?

Mr. CHAPMAN. And my secretary, Mrs. Harding.

Mr. HOLIFIELD. What is your background of experience, Mr. Chapman?

Mr. CHAPMAN. Well, I have been around the Government for about 18 or 19 years.

Mr. HOLIFIELD. What type of work have you been doing for the Government?

Mr. CHAPMAN. Before I entered on this assignment, a year ago next week, I had been executive officer for the Urban Renewal Administration. That was primarily an administrative job—budgeting, personnel, procedures, manuals, things of that sort.

Mr. HOLIFIELD. What is Mr. Yarger's background?

Mr. CHAPMAN. He was last with the Commission on Intergovernmental Relations and before then he had been doing various types of consultant work for State and local government.

Mr. HOLIFIELD. In what field?

Mr. CHAPMAN. Primarily, I think, personnel administration.

Mr. HOLIFIELD. What did he do with the Intergovernmental Commission?

Mr. CHAPMAN. Among other things he was assigned to work on one of the task forces—or on a task force—that was looking into governmental housing programs. That assignment had no personnel implications but had to do with governmental——

Mr. HOLIFIELD. That had to do with financial indications and that type of thing I suppose.

Mr. CHAPMAN. That is right.

Mr. HOLIFIELD. Rather than technical structures of building.

Mr. CHAPMAN. No, it did not have anything to do with the technical aspects of structures. I think it had to do, more or less, with the governmental process of making Federal assistance available to communities in the housing field or the urban renewal field or any other program we handle.

Mr. HOLIFIELD. Why did you feel he would be of value to you in this work? You said he is a personnel worker and you have no personnel to supervise.

Mr. CHAPMAN. The reason I was impressed by his background, as I recall it, was his administrative experience and point of view. The nub of our problem, under the delegation, is to devise some means whereby we can provide, as the delegation directs us to provide, several types of assistance to the States. It seems to me that one of the important things that we in our Agency have to work out is the administrative mechanism of getting into this complex field.

We do, in some of our normal programs, have a conduit that takes us from the Federal Government to the locality. We have only one program that normally puts us into direct contact with State agencies.

Mr. HOLIFIELD. Let's take your first delegation:

conducting research and providing technical guidance to the States concerning protective standards for new housing construction and temporary shelter in existing housing facilities.

Your group is not equipped either by funding or personnel to do that job.

Mr. CHAPMAN. No.

Mr. HOLIFIELD. As a matter of fact you have not done that.

Mr. CHAPMAN. No.

Mr. HOLIFIELD. No. 2 delegation:

Planning a national program, providing technical guidance to the States, and directing Federal activities concerned with the provision of temporary housing in support of areas subjected to—

and I notice that is in the past—

to enemy attack.

Mr. CHAPMAN. Yes. I was trying to bring the language in my prepared statement into conformance with the exact language of the delegation.

Mr. HOLIFIELD. Yes. As a matter of fact you have not planned a national program.

Mr. CHAPMAN. We have submitted a budget program to get one underway.

Mr. HOLIFIELD. You have not been able to plan it because of your lack of funding and lack of personnel.

Mr. CHAPMAN. That is right.

Mr. HOLIFIELD. You have not provided any technical guidance to the State, have you?

Mr. CHAPMAN. No.

Mr. HOLIFIELD. You are not in a position to direct Federal activities concerned with the provision of temporary emergency housing, are you?

Mr. CHAPMAN. No, sir. May I make one statement there?

Mr. HOLIFIELD. Yes.

Mr. CHAPMAN. I think our Administrator and my own immediate superior, and others in the Agency have interpreted our mission under this delegation to be to plan a program under which we can build the responsibilities that have been given to us into the Agency as a whole. In other words, the objective is that as funds are made available to the Administrator they will be reallocated to appropriate divisions, units, and constituents of our Agency, so that advantage can be taken of the technical know-how already existing within the Agency.

My staff has worked closely with the representatives of the constituent agencies. We have tried to develop a program so that when funds are available we can set up the necessary projects and programs and, working with FCDA, get them on the road.

Mr. HOLIFIELD. Delegation No. 3:

Planning a national program, developing technical guidance for States, and directing Federal activities concerned with the emergency restoration of essential housing.

Just exactly what does that mean, "the emergency restoration of essential housing"? Does that mean that the Housing and Home Finance Agency is going to do this work?

Mr. CHAPMAN. Well, I would certainly say that, if we do have an attack of the sort that was envisioned in Operation Alert, the only way the Nation as a whole could withstand it would be for the States and localities to have done the necessary preparatory work. It is my hope that, through the competence that our Agency possesses, we may be able to develop the necessary guidance for local civil-defense organizations and other local community organizations so that if this does happen they will be able to meet their responsibilities.

Mr. HOLIFIELD. What kind of planning can you do? Let's take a practical case. Let's take the case of the city of Syracuse, for instance, in case the enemy attack hits Syracuse. What can you do by going in and advising local people what to do to restore their buildings?

Mr. CHAPMAN. I certainly agree with you that as of that time we can do nothing.

Mr. HOLIFIELD. But that is what your third delegation says. It says:

To go in and give Federal guidance to the restoration of essential housing and related community facilities damaged by enemy action for which the Agency normally has legal responsibility.

Maybe we better get down and find out for what facilities in the city of Syracuse your Agency has legal responsibilities.

Mr. CHAPMAN. I think I could do a better job of writing this if I did it myself.

Mr. HOLIFIELD. You did not write it and I am not holding you responsible but I would like to know your understanding of that.

Mr. CHAPMAN. The phrase "The Agency normally has legal responsibility" I think modifies "related community facilities." This is meant to distinguish between the type of community facilities that our Agency has responsibility for——

Mr. HOLIFIELD. What type of community facilities would you say would be involved—public-housing facilities, for instance?

Mr. CHAPMAN. No, I am thinking of waterlines, sewer lines—community facilities has not been exactly defined—school buildings.

Mr. HOLIFIELD. You are not legally responsible for those.

Mr. CHAPMAN. We do work at the present time under a delegation from the Office of Education in the field of school construction in federally impacted areas, and conceivably in some of our——

Mr. HOLIFIELD. Let's explore that a minute.

We built some schools with Federal aid in my district that was a grant-in-aid to the State board of education in the State of California. It was under the jurisdiction of the local school boards who

hired the contractors who built that school in the State of California and in the community in which they lived.

Where does the Housing and Home Finance Agency come into that?

Mr. CHAPMAN. Under the provision of the particular law, which has to do with the provision of school facilities in federally impacted areas, we do a good deal of technical work for the Office of Education. My point, sir, is that paragraph No. 3 means to me that we have certain responsibilities, as described there, to assist States and localities in the undertaking of civil defense preparedness measures; that operating under FCDA's direction, we would try to improve the capability of State and local bodies to carry out that type of a mission in the event a real emergency should occur. I do not mean to imply that, as of the time the bombs fall or immediately thereafter, the Federal officials could possibly get into these communities and take over.

The localities themselves have to be prepared; and I understand that generally to be the philosophy of Public Law 920.

Mr. HOLIFIELD. You expressed some displeasure with the way this is worded. Have you sought from FCDA clarification as to this delegation of authority, exactly what they want you to do?

Mr. CHAPMAN. Our program for 1957 was worked out in constant consultation with FCDA.

Mr. HOLIFIELD. You should be able to tell us now what the results of those conferences were. Did they clarify this to the point where you can explain this to the subcommittee?

Mr. CHAPMAN. Let me try again. As I see it, this paragraph relates to the actions that our Agency should now take, under FCDA leadership, to prepare localities for the job of restoring whatever damaged housing and facilities might result from an enemy attack.

Mr. HOLIFIELD. Have they given you such directions and such guidance and such leadership?

Mr. CHAPMAN. Has FCDA given us such direction and leadership?

Mr. HOLIFIELD. Yes. In this field, have they clarified this and directed you as to what you should do in the way of planning a national program? They have either delegated it to you or they are going to coordinate this planning with you. Have they actually done this?

Mr. CHAPMAN. As I understand it from talking with officials at Battle Creek, they are looking to us under such general assumptions as are made available to us to develop the type of program that we think should be developed so that the local civil-defense organization of Syracuse and of the support area around Syracuse would have the proper talent mobilized, would have some criteria to determine whether or not a particular community should be restored.

For example, in the recent flood devastation that occurred in your State, Mr. Holified, and in New England, various parts of our Agency did come in and did lend assistance and did work with communities in terms of whether or not it was feasible, (*a*) to restore a given damaged area or (*b*) to provide for new type uses.

Mr. HOLIFIELD. Woudn't that be the determination of the local persons whose properties are involved?

Mr. CHAPMAN. That is right.

Mr. HOLIFIELD. I fail to see where you can render a service in that field in view of the fact that the personal financial concern of the

individual whose house was damaged would be up to him to decide whether he wants to restore it or abandon it, it would seem to me.

Mr. CHAPMAN. I was thinking here of say an entire community that would have been destroyed. It seems to me that if a cataclysm of the sort that we had in our assumptions for the last Operation Alert should ever occur that one of the housing resources that would exist for the survivors would be housing that was say partially or only slightly damaged. There might be technical advice and assistance that we as a Federal agency could develop, in the preattack phase, concerning stopgap emergency repair techniques that could be employed to make these houses livable.

Mr. HOLIFIELD. This delegation was approved by the President in September of 1954 and you received your delegation apparently during the fiscal year 1955.

Just when did you receive it?

Mr. CHAPMAN. I have it here—September 8, 1954.

Mr. HOLIFIELD. That is the approval by the President of the delegation. Over on your page 2, you say, in the second paragraph, "Our delegation from the FCDA Administrator was received during fiscal year 1955." My question was what time during the year 1955 did you receive it?

Mr. CHAPMAN. We received it September 8, 1954, which is fiscal 1955.

Mr. HOLIFIELD. I see. So that is the same time.

Mr. CHAPMAN. That is right. We did not receive any allocation of funds until fiscal year 1956.

Mr. HOLIFIELD. That is right, the current year.

Mr. CHAPMAN. Yes.

Mr. HOLIFIELD. What month did you receive it?

Mr. CHAPMAN. The letter came in in August—the allocation was actually made in August 1955.

Mr. HOLIFIELD. So you have actually only had funds for less than a year.

Mr. CHAPMAN. That is right.

Mr. HOLIFIELD. This is not said in derogation of you as an individual or of your group but in trying to analyze for the benefit of the subcommittee's understanding, you have not been able to contribute at this time to our civil-defense progress; have you?

Mr. CHAPMAN. I would agree with you 100 percent.

Mr. HOLIFIELD. Could you give us some information on page 3 in regard to these buildings? That refers to the Nevada tests.

Mr. CHAPMAN. That is right. That was called Operation Teapot.

Mr. HOLIFIELD. Was your group in charge of building those buildings or was that—I assume that was the work of the FCDA or some other agency.

Mr. CHAPMAN. May I ask Mr. Randall to answer that question? He was out there.

Mr. RANDALL. That was FCDA responsibility.

Mr. HOLIFIELD. They built it?

Mr. RANDALL. Yes.

Mr. HOLIFIELD. Did they build it according to plans and specifications which you prepared?

Mr. RANDALL. No, they prepared plans and specifications which were submitted to the agency and reviewed and approved.

Mr. HOLIFIELD. Were they of normal type of building or were they of special type of construction?

Mr. RANDALL. Two of them were conventioned, 2-story brick houses, 2 were a conventional 2-story frame house that were strengthened to some extent to resist blast. Two were rather a special type house of precast concrete, 1 story, designed to meet California or earthquake provisions and 2 were reinforced masonry-block house.

Mr. HOLIFIELD. What was the result of the tests?

Mr. RANDALL. The masonry house on the 4,700-foot line was practically destroyed. The one-story rambler on the same distance was also destroyed at that location. The two earthquake-resistant houses on the same line met the blast very well. They, of course, lost all their windows and doors, but structurally there was rather minor damage. Some of the connections were loosened to some extent but not materially.

Mr. HOLIFIELD. That was at a distance of——

Mr. RANDALL. 4,700 feet, from ground zero.

Mr. HOLIFIELD. Not quite a mile, it was a 30 kiloton bomb?

Mr. RANDALL. Yes, sir.

Mr. HOLIFIELD. 30,000 tons of TNT equivalent.

Mr. RANDALL. Yes.

Mr. HOLIFIELD. So the result of that particular test would be meaningless in terms of megaton bombs; would it not?

Mr. RANDALL. I would think so. That is definitely true.

Mr. BALWAN. Would that correspond to any particular ring in the parlance we use outside of AEC or the military? Is it in the B ring or C ring or D ring?

Mr. RANDALL. I could not answer that. I don't know.

Mr. HOLIFIELD. Taking your planning to the future to develop protective standards for new housing, you have done nothing on that at the present time?

Mr. CHAPMAN. No.

Mr. HOLIFIELD. Your development of standards for construction of shelter in existing houses, have you done anything along that line?

Mr. CHAIRMAN. Not in technical terms. Under title I of the National Housing Act, which is administered by FHA, the individual homeowner can go to an approved lending institution and get a home-improvement loan—in other words a bomb shelter would qualify under that title.

Mr. HOLIFIELD. You haven't passed your approval on any criteria for the technical construction of that type of shelter in the basements or in the homes yet; have you?

Mr. CHAPMAN. No. The release put out by FHA on that subject prescribed that homeowners who apply for this type of loan should be advised to consult with their local Federal Civil Defense Administration office for advice as to design and construction specifications to assure their obtaining the type of shelter considered to be best suited for the particular area.

Mr. LIPSCOMB. Did you say that FHA has advised people who loan money that they could make loans on shelters?

Mr. CHAPMAN. Yes, sir.

Mr. LIPSCOMB. Do do you feel that FCDA has been informed of that fact?

Mr. CHAPMAN. Yes; I am sure they have.

Mr. LIPSCOMB. I have a pamphlet that I just received put out by the Montgomery County Civilian Defense organization in Maryland, and they state in this pamphlet that people should prepare themselves with shelters but they say "possibly FHA financing for shelters is now under consideration."

Do you think the information is out yet that they can obtain FHA loans on shelters?

Mr. CHAPMAN. This release dated July 28, 1955, I will be glad to leave with the committee. It has to do with—do you want me to read it into the record?

Mr. HOLIFIELD. If it is responsive to Mr. Lipscomb's question.

Mr. CHAPMAN. It apparently is concerned with the relationship between the lender and borrower. This particular release points out in the first paragraph:

> The FHA is concerned over the possibility that unscrupulous dealers may set up sales organizations to promote the sale of bomb shelters. It is felt that high-pressure operators will resort to scare-selling techniques to persuade homeowners to purchase inadequate, overpriced, and shoddily constructed shelters.
>
> The Administration, in keeping with long-standing policy with respect to title I loans, does not endorse, approve, or recommend any particular type of shelter. This fact should be pointed out to the prospective borrower as well as the fact that neither the FHA nor the financial institution makes any inspection of the completed job. It is requested, therefore, that homeowners who apply for this type of loan be advised to consult their local Federal Civil Defense Administration office for advice as to design and construction specifications to assure their obtaining the type of shelter considered to be best suited for the particular area.
>
> For the reasons pointed out, insured lenders are requested to approve bomb-shelter loans only on a direct-to-borrower basis. The personal negotiation with the borrower afforded by the direct type of transaction will tend to eliminate high-pressure deals and will give the lender opportunity to suggest consultation between the borrower and the local civil-defense authorities prior to consummation of the loan.

I will be glad to leave the whole release. What I have read is the most responsive part. We have taken the view, and I am sure FCDA will confirm this, that under title I bomb shelters are eligible to receive title I loans from lending institutions, that is title I insured loans.

Mr. LIPSCOMB. Do you feel from your knowledge that this statement in this civil-defense folder is correct? It says, "Possible FHA financing for shelters is now under consideration." Or do you think this statement is now outdated?

Mr. JARCHOW. It sounds to me that it would be outdated. It does not seem to agree with the statement contained in that memo which was sent out last year to all title I lending institutions.

Mr. LIPSCOMB. In your relationships with FCDA, would they have this information available to them?

Mr. CHAPMAN. I am reasonably sure that when this release first went out copies were made available to FCDA.

Mr. HOLIFIELD. Do you know of any loans that have been approved by your agency for bomb shelters?

Mr. JARCHOW. I know of none.

Mr. HOLIFIELD. Do you know of any criteria that have been set up by your agency to make available to people who might want to build shelters to prevent them from falling into the hands of any fly-by-nights?

Mr. JARCHOW. I am sure we have not issued any criteria because we do not have it, sir. We do not have the information upon which we could issue criteria.

Mr. HOLIFIELD. Do you not conceive that to be part of your delegation here, of responsibility?

Mr. JARCHOW. Is that a question you are addressing to Mr. Chapman?

Mr. CHAPMAN. FHA as I understand it under its title I program does not pass upon the technical specifications of any title I loan. That is the responsibility of the title I lender. Isn't that correct Mr. Jarchow?

Mr. JARCHOW. That is correct. That memo was addressed to title I lending institutions and applied solely to that type of insured loan which is sometimes described as a modernization loan. Those loans are made by lending institutions without approval by FHA except in a small minority of cases where the loans exceed a certain limit, where they exceed $2,500 for any one borrower.

Mr. HOLIFIELD. Mr. Chapman, may I ask this question? Do you not conceive that it is under your first delegation, first paragraph delegation provided there, to conduct research and provide technical guidance to the States concerning protective standards for new housing construction?"

Would you think it would come within your range of responsibility to develop these standards so they can be incorporated in the approved type of structures for FHA loans or for modification loans?

Mr. CHAPMAN. Certainly. I think—I tried to make it clear in my statement that one of the things that we would do in our agency under this delegation would be to keep abreast of technical developments and to make such additional investigations as we believe necessary, not only with respect to shelters that would be appurtenances to dwellings but also with respect to standards that would be incorporated into dwellings. I can say very frankly that what our agency knows technically about this today is very limited.

Before embarking upon such a program we should conduct additional investigations.

Mr. LIPSCOMB. Now, in your proposed program for 1957 under No. 2 you say "we shall consider the steps which the agency might appropriately take in connection with existing programs to provide incentives for homeowners to construct adequate shelters."

What did you have in mind there?

Mr. CHAPMAN. I would assume that if, under our delegation, funds become available and we do pull together such information as is available, working with the building industry, it would be quite appropriate for us to join with FCDA in putting out a technical manual or some appropriate release to the public that would encourage the construction of that type of shelter.

Mr. LIPSCOMB. In other words, perhaps part of your recommendation would be for FHA loans to be made available for the construction of shelters?

Mr. CHAPMAN. Yes.

Mr. LIPSCOMB. As an incentive.

Mr. CHAPMAN. Yes. Or we might want to recommend additional legislation to provide even more incentive.

Mr. LIPSCOMB. Did you have anything to do with this memo that was put out by FHA to their lenders?

Mr. CHAPMAN. No, sir.

Mr. LIPSCOMB. You consider an FHA loan being made available to a homeowner for a bomb shelter as an incentive; don't you?

Mr. CHAPMAN. Yes. Is that a Montgomery County Civil Defense Release?

Mr. LIPSCOMB. Yes, sir.

Mr. CHAPMAN. It refers specifically to shelters.

Mr. LIPSCOMB. I took that sentence out of context. But it is a message to all county residents and it says the county council—

believes all residents less than 20 miles from the White House should have ready access to shelters, beyond 20 miles have fallout cover, possible FHA financing for shelters is now under consideration.

If they are trying to get people to take cognizance of this type of thing and provide themselves with shelters, and if people can already obtain FHA loans to build these shelters, they should be apprised of that fact. The sooner the better.

Mr. CHAPMAN. I agree with you.

Mr. LIPSCOMB. I would like to ask with reference to this $25,000 that you have delegated to you now in this fiscal year, you said that there was a little over $21,000 already spent, which means that you're spending approximately $2,700 a month. What happens—you still have 3 months to go or a little over $8,000 to go. What happens to your operation when you run out of funds?

Mr. CHAPMAN. Well, of course I don't think I would be fired right away. I was on board for several months before funds were made available. The agency absorbed that cost as a part of its regular overhead. I don't want to mislead the committee in thinking that every minute of my time during the time I have been there or of the time of my associate or my secretary has been entirely devoted to FCDA. We do have delegated responsibilities also from ODM and I don't know at this point how the budget officer keeps the books straight on this expense. My statement should make clear that we have related defense mobilization responsibilities from ODM.

Mr. HOLIFIELD. I was going to get to that point and ask you just exactly what parallel responsibilities ODM has that you have.

Mr. CHAPMAN. This is from defense mobilization order I–14 dated November 26, 1954:

The measures for which the Housing and Home Finance Administrator is responsible are as follows:

(*a*) develop requirements for housing and community facilities, construction, repair and rehabilitation in event of mobilization or attack on the United States and translate these needs into resources required.

(*b*) develop plans for and be prepared to undertake such housing and community facilities programs as will be necessary in event of mobilization or attack on the United States.

(*c*) under the policy direction and coordination of the Office of Defense Mobilization, develop programs and regulations relating to the financing, rent stabilization, and allocation of housing for varying mobilization assumptions.

(*d*) develop and maintain plans to insure the continuity of the essential functions of the Housing and Home Finance Agency in event of attack on the United States.

Mr. HOLIFIELD. Is that your responsibility or the ODM?

Mr. CHAPMAN. That is what the ODM has delegated to the Housing and Home Finance Administrator. I will be glad to leave this for the record.

Mr. HOLIFIELD. You have had a delegation from ODM as well as the FCDA?

Mr. CHAPMAN. That is right.

Mr. HOLIFIELD. Have they allocated any funds to you to carry this out?

Mr. CHAPMAN. They have not.

Mr. HOLIFIELD. Do they have an additional fund in ODM besides the $25,000 for their functions from FCDA, do you know?

Mr. CHAPMAN. We have totally absorbed the responsibilities delegated to us by ODM.

Mr. HOLIFIELD. You have absorbed the responsibilities they delegated to you but you have not done anything to fulfill it, is that it?

Mr. CHAPMAN. We have been working pretty hard on the delegation.

Mr. ROBACK. Is this put out by the Defense Mobilization Agency?

Mr. CHAPMAN. Yes. It is signed by Dr. Flemming.

Mr. ROBACK. By what authority do they set the priority for your work program? Do they have authority to organize your work program?

Mr. CHAPMAN. I don't know. I have not received any specific directions from them.

Mr. HOLIFIELD. Have you given any periodic reports of programs to them?

Mr. CHAPMAN. I serve on the ODM Mobilization Planning Group. I am over there part of 2 days a week. They have submitted no requests to us in the way of a formal report. I keep them constantly advised of what we are doing under various assignments we do have.

Mr. ROBACK. Are you acquainted with the defense mobilization assumptions and objectives of the United States?

Mr. CHAPMAN. Yes.

Mr. ROBACK. What is that?

Mr. CHAPMAN. To a certain extent.

Mr. ROBACK. You have to carry out a program that is consistent with those assumptions by this order?

Mr. CHAPMAN. Yes.

Mr. ROBACK. Where are those assumptions and objectives stated to your knowledge?

Mr. CHAPMAN. There are certain assumptions to apply to each of the various mobilization plans that Dr. Flemming's organization is developing.

Mr. ROBACK. Have you prepared under the delegation a statement of those objectives?

Mr. CHAPMAN. The statement of the objectives of the Housing Agency under the overall——

Mr. ROBACK. No, of the national objectives so that in organizing your work program you know there will be consistency.

Mr. CHAPMAN. Yes, sir. I think the work we are doing with ODM is consistent with the mobilization objectives that are stated in various documents we are working with.

Mr. HOLIFIELD. The requirement of the ODM is that you submit to them work programs for review in order to assure consistency. Have you submitted any proposed work programs to them for review?

Mr. CHAPMAN. In connection with our defense mobilization work we have. They make certain assumptions available to us which are

also made available to other agencies with mobilization assignments. We then prepare the documents that follow from that.

Mr. HOLIFIELD. Have those assumptions been given to you in written form?

Mr. CHAPMAN. Yes, sir.

Mr. HOLIFIELD. What are those assumptions?

Mr. CHAPMAN. This is getting into a classified area. I assume that Dr. Flemming will be testifying about it before the committee. I really am not free to testify on this. I think Dr. Flemming has made clear at least before the Appropriations Committee that there are several plans. There are four basic plans that are being developed.

We are busily engaged now in working on two of these basic plans.

Mr. ROBACK. You have referred in your statement to similar and parallel responsibilities.

Do you construe any of these to be overlapping and duplicating?

Mr. CHAPMAN. I think they are necessarily overlapping. I think that the delegation from ODM for instance directs us to take into account the delegation we have from FCDA. The type of housing community facilities, programs we would develop under varying mobilization assumptions would have to be consistent with the delegations we have received from FCDA.

Mr. ROBACK. Well, is the delegation from the ODM, does that necessary parallelism result from the fact that both agencies are dealing with the same matter as you understand it?

Mr. CHAPMAN. Yes. In clarifying my own thinking in this preparedness area, I have looked upon the FCDA delegation as one directing us to take certain planning steps to improve the capability of States and localities to meet a civil-defense emergency. Our delegation from ODM is a direction for us to take certain steps in terms of Government, that is Federal Government, readiness to meet that emergency.

I found in working with ODM and FCDA that while there is to some people a good deal of conflict that at least, in my own work, I have been able to reconcile what may seem to be conflicts.

Mr. LIPSCOMB. Could you tell us what your request was for some money for the fiscal year 1957 to cover your delegation from FCDA?

Mr. CHAPMAN. $600,000.

Mr. LIPSCOMB. Do you have any idea at this time what has happened to that budget for the delegations?

Mr. CHAPMAN. That was included, as you know, in the FCDA budget. They had a special section of their budget which is for all delegate agencies. They have had their hearings before the House Appropriations Committee, and the House has taken action. We would end up with approximately $25,000, if the House action prevailed.

I think it is now about to go before the Senate Appropriations Committee.

Mr. LIPSCOMB. The way it now stands you will not have any more money next year to carry out your duties next year than you did this year?

Mr. CHAPMAN. That is right.

Mr. LIPSCOMB. Well, when you run out of money, as it is possible for you to do on this year's allocation, what is the procedure? Do you

notify FCDA that you are running out of money and that you need more?

Mr. CHAPMAN. Our Administrator has recently written the FCDA Administrator and advised him that in the event we are obliged to operate at the same level, $25,000 for fiscal 1957 as we are operating in fiscal 1956, he will want to reexamine the language of our delegation so that the responsibility we are charged with is tailored to fit the amount of money that we have to carry it out.

I don't think we can pretend that we can do all these things if we have only $25,000.

Mr. LIPSCOMB. With $25,000 all you can do is keep a staff there and perhaps keep making plans for future programs.

Mr. CHAPMAN. Either that or just a normal liaison type of relationship with FCDA——

Mr. HOLIFIELD. Where you get together and have conferences and have breaks and that sort of thing.

Mr. CHAPMAN. I certainly would not—I would say this: I have found the $25,000 we have had this year, at least as far as I am personally concerned, to be of value to the Agency because, for example, there were seven conferences on a regional basis which FCDA sponsored, in which the delegate agencies—Commerce, and Agriculture, and others—pulled in their counterpart field people. We, from Washington, went to the field and met with them and explained the whole theory of the delegation program and what the objectives were.

I think under FCDA's leadership, the delegate agencies are preparing to put a show on the road. Whether they will be able to do it I don't know.

Mr. HOLIFIELD. Is there any further question?

Mr. LIPSCOMB. No questions.

Mr. HOLIFIELD. Thank you very much, Mr. Chapman, for your testimony.

It has been very interesting and will be helpful to the committee.

Mr. CHAPMAN. Thank you very much.

Mr. HOLIFIELD. The subcommittee is adjourned.

(Whereupon at 12:10 p. m. the hearing was adjourned.)

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